Along the bowstring or south shore of Lake Superior

Lake Superior ALONG THE SOUTH SHORE

Presented 61 WITH THE COMPLIMENTS OF THE PASSENGER DEPARTMENT OF DULUTH SOUTH SHORE & ATLANTIC RAILWAY

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Map of the Duluth, South Shore and Atlantic Railway and Connections Am Bk Note Co.N.

ALONG THE BOWSTRING 426 OR SOUTH SHORE OF LAKE SUPERIOR.

BY JULIAN RALPH.

ISSUED BY THE GENERAL PASSENGER DEPARTMENT OF DULUTH SOUTH SHORE & ATLANTIC RAILWAY.

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MUNISING BAY.

From “Outing.”

THE PLOT OF THE STORY.

They traveled and they traveled And the next thing they did spy Was the moon behind a hill-top, And that they left behind— look a’ thar! Now, the one he said it was the moon But the other he said ‘nay,’ So they ‘lowed it was a green cheese With the rind all cut away— look a’ thar! — *College Song.*

One of the most original of my acquaintances said to me once that he had spent an evening with M. Flammarion, the greatest of astronomers, and had taken that occasion to catechise the master about other worlds than ours. “And do you know,” said he, “that after hearing about all the other planets I have come to the conviction that this is a good enough world for me? It is true that this world has defects; for instance, a man cannot have his picture put on the postage stamps until after he is dead—but, take it all in all, I shall be satisfied if I get my share of all the fun and beauty, and sight-seeing and good eating and pleasant company this rolling pill affords without caring a snap to live in Saturn and get a couple of celestial belts thrown in, like chromos.”

But one of the best features of life on this planet is the fact that no man or set of men can make it different. In spite of them, it keeps rolling around and exposing to solar view characteristics and portions in which they take no interest. A powerful body of persons, for instance, is satisfied to go to Newport every year at vast expense, to move in a tiny set whose lives are devoted to proving that the Declaration of Independence is all wrong, and that only a few are created equal while all the rest are vulgar. A still more influential body of persons think the sum of human happiness is reached if they can go to Brighton,

England, to ride or walk up and down a stone embankment with towering hotels on one side and a cold ocean, unfit for either bathing or boating, on the other. When we think of these people and of the hosts of Americans who must go abroad to 6 be happy or who want to be cramped up in some barn-like, big hotel in the White or Catskill Mountains, or else must go where they can eat course dinners and waltz away every night to dulcet music—when we think of these and the other thousands of sorts of people and tastes there are, we know that no single book or region or thing can suit them all, and we thank Heaven the world is large and varied enough for them and for ourselves.

The person to whom this book is addressed are those who want a new field for recreation, for those who love Nature in her most beautiful guise, for those who seek a mild and equable and invigorating summer climate, for those who can appreciate the purest and sweetest air to be found on earth, made of an admixture of the breadth of vast forests and of the atmosphere of the largest body of fresh water known to man. That seems a large constituency to whom to dedicate a book, but there are others still who will be gladdened and stimulated by what is here set forth, for the region that offers all that I have here enumerated is also a vast and teeming sportsmen's resort —the best stocked natural fish and game preserve within easy reach of the centre of population. How this can be, in the same territory with fine modern hotels and swarming summer resorts and bustling, progressive cities, the reader will discover as he rides over a perfectly equipped, luxuriously appointed railway, either metaphorically by reading the pages that follow or actually by pursuing the advice they contain.

The force of the ballad quotation at the head of this introductory chapter will be noted when the reader understands that travelers do not always agree even about the objects they encounter in their wanderings. There are travelers whom few can ever agree with—travelers who *write up* countries and travelers who write countries *down* . This traveler and this book seek no such purpose. They will treat of a country as they found it; and as they left is so it will be found by those who go after them.

ALONG THE BOWSTRING.

A glance at the map of our country will show you where the Bowstring is; but if, instead of finding it for yourself, I tell you to what he phrase is applied, the aptness of it will strike you at once. It is the south shore of Lake Superior—practically a straight line, like the string of a bow, connecting the ends of the magnificent curve of the upper side of the great crystal sea. Whatever the actual wavecarved southern coast of the lake lacks of evenness is now corrected by the mathematical line of the DULUTH, SOUTH SHORE AND ATLANTIC RAILWAY. The rails are laid down with the directness that is peculiar to a tautened string, and this enhances its great value to the traveling public while, at the same time, it misses none of the scenic attractions of the wonderful panoramic region close to the lake.

How many who have not seen Lake Superior have ever allowed their fancy to estimate what it must be—that great bowl which we, magnificent belittlers of the grandest of Nature's achievements, call a lake, yet which, were it in Europe, would have become on of the seas of the world, paraded by fleets of war and dividing empires?

It is the largest body of fresh water in the world, as we have all heard time and again; but those are mere words, and convey no idea that any mind can grasp. How long and wide is it, how does it compare with salt-water seas of which we know, and how with bodies of land of which we have some knowledge? By such an analysis we shall learn that Lake Superior is indeed one of the wonders of Nature and one of the proudest of our possessions—or semi-possessions, to speak more correctly. The great lake is 360 miles long and 140 miles wide at its largest crossing. It possesses a superficial area of 32,000 square miles,or four times as many square miles as the State of Massachusetts. Roughly speaking, if we could turn the State of Indiana into water it would make another lake the size of Superior. Michigan itself is not twice as large, nor is Wisconsin, which is a trifle smaller than the State of Michigan. Lake Superior has 1500 miles of coast, or within 500 mile of the coast extent of the great Black Sea.

But the seas of the world are salty, and this lake is like a colossal diamond—clear, pure, sparkling, lying like a heaven-lighted gem in a bowl of rich greenery fringed with a lace-work of chromatic rocks that take on the most weird and enchanting shapes. The transparency of the water is so remarkable that it is no uncommon thing to see the complete outlines of a boat as it moves through the water, and I have myself seen not only all the divisional lines in the hull of a lake propeller and her keel and rudder, but the screw itself, while it revolved slowly, was in plain sight, so that the vessel looked as it might do if it were moving through the air. This astonishing clearness is not peculiar to the great lake alone, but is a characteristic of all bodies of water in the entire Lake Superior region, be they little lakes or big ones, be they rivers or rivulets. At Marquette or Mackinac, or wheresoever you journey in this paradise of the seeker for pure air and Nature unalloyed, you may count the pebbles in the water's bed at a depth of twenty-five feet. Nature's other handiworks are equally clean, if I may use the expression, so that all the beautiful rockwork that illuminates the lake shore scenery is as sharply defined and trimly cut as it is possible to conceive it. The giant cliffs that rise above the 8 great lake—itself 630 feet above sea-level—lift their lengths sheer into the air without any of the usual clutter of rubble and rubbish that is washed down and banked halfway up the sides of similar cliffs in other parts of the country. This it is that gives their wonderful charm to the Pictured Rocks and to the cliffs about Mackinac and elsewhere; no walls reared by men's toil rise more freely and cleanly above their bases.

Globe-trotters and wonder seekers who fancy that if they have “done” Yosemite and seen Niagara they must seek foreign climes for other experiences worthy of their effort, will travel the world around and find no counterpart of Superior. It is grand, majestic, sublime and beautiful, and no part of

it is more wonderful or worthy of description than the reach of four hundred miles made by the Duluth, South Shore and Atlantic Railway beside the gleaming waters upon which Longfellow causes the mystic Hiawatha to embark and sail away into the oblivion which

shrouds perpetual life. The greatest of America's poets never was greater than when he wrote these lines, commensurate with the grandeur and color and weird effects of the lake and its scenery: On the clear and luminous water Launched his birch canoe for sailing; From the pebbles of the margin Shoved it forth into the water; Whispered to it. ‘Westward! Westward!’ And with speed it darted forward, And the evening sun descending Set the clouds on fire with redness; Burned the broad sky like a prairie; Left upon the level water One long track and trail of splendor, Down whose stream, as down a river, Westward, westward, Hiawatha Sailed into the fiery sunset, Sailed into the purple vapors, Sailed into the dusk of evening.”

I met an Ojibway Indian across on the Canadian side of the lake, and, not half believing he would understand a word of what I repeated, asked him if he knew those Indian words I remembered that Longfellow used in his poem. Many of them he knew and others he was familiar with in slightly altered forms. It was a tribute to the sincerity and accuracy of the poet that he should have mastered so much of the old Algic tongue, whose differing dialects are yet spoken by all the red men on our northern border, from 9

FISHING IN THE RAPIDS.

the Rockies to Maine. But to me, alone in a canoe in a bay of the great lake, with a red man as a companion, there was a mysterious accord between my feelings and the soft cadence of the grand song of Hiawatha. I ventured to express my feelings to a friend on shore who had no idea or object above the getting of trout or deer, and he rudely broke the spell of my fancy.

“So that's what you've been thinking about, eh?” said he. “Well, I've been thinking about tomato cans and picnic grounds, and excursion boats and fellows in tennis blazers. They'll all be here the first thing you know. This whole lake will be ruined as soon as folks find out about it. It will be a regular summer stamping ground for the whole country, and where will we go to fish and get deer then? Old Sir John Lubbock is perfectly right. He says the time is not far off when no animal as large as a sheep will remain on earth, and that the

hunters of that period will go armed with microscope, and will search for queer insect life in swampy glens. Bah! when I think of the shooting galleries and dancing pavilions and lovers' walks that the shores of this lake will surely soon be turned into, it makes me tired."

He was right. The great American people will not long be satisfied with the small space along the Atlantic coast that is available for summer resorts. As the population multiplies, convenience as well as superior attractions will develop this more salubrious region. It was a *terra incognita* too long. Discovered for the white man 240 odd years ago, the great lake remained for nearly two centuries almost unknown to the world at large. Even to-day it is not sufficiently well known to take its rank among the wonderlands of the continent, and we see Florida and the Pacific coast discussed and pictured ten times to every mention of this region of more potent attractions. The signs that the nation at large is awakening to its beauties are unmistakable, however, and the people are beginning to claim that which the missionary, the fur trader, the hunter and the aborigine have too long enjoyed by themselves.

The first time I touched the hem—if I may borrow a woman's word—of that vast sheet of water I saw a tiny member of the vanguard of the coming 10 multitude. He was a little boy who appreciated the privilege of living amid all that grandeur, as the sequel showed. I disturbed him in a cause in which he felt that two could not engage, for as I approached he stooped, and, seizing a pebble, flung it into the water.

"There!" said he, "that settles it. I'll never see you again."

I engaged him in a moment's conversation, and learned that this was his very original method of bidding adieu to the lake, which had been regarded by him as a sort of companion and playmate, for he had no brothers and sisters, and of houses there were none other than his own home in many miles around.

"Do you like living here?" I inquired.

“Yes, I do,” he said, quite positively, “and Pop likes it; but Marm says there ain't to ‘sassiety’ here and she won't stand it—and whatever Marm says ‘goes’ with Pop—and that settles it.”

I felt in my heart that the woman was right; indeed, in a moment the boy took himself off and I, too, was left without “sassiety.”

I could *feel* the immensity of the unsalted sea that reached away before me. Since then I have come upon Superior at different points, and everywhere that imperial quality has impressed itself upon my mind. It is not merely big in itself, it is big in all its environments and details—in what you might call all its features. In few parts of the coast of the Atlantic itself has Nature done such bold, majestic work as she scatters lavishly all around Lake Superior; indeed, south of New England the Atlantic is dependent upon the imagination of the beholder for the awe and respect it inspires, since what might be called its shore scenery is everywhere tame. Very, very far from tame is the setting of this grand bowl of clearest water which our nation seems to be holding above its head, as if in a perpetual invitation for all the world to partake of our bounty; or, better yet, as if holding

up a goblet in offer of this incessant toast to all mankind:

“Your health.”

Massive stony walls, giant cliffs, fierce battlemented rocks, are the characteristics of Superior's shores; mighty fortifications against the still mightier water, for everywhere the eternal masonry of the land is torn and ragged.

If you look upon a map of our country and draw your pencil from Sault Ste. Marie at one end of Lake Superior, to Duluth at the other end, you will have marked a straight line, and that straight line is the route of the Duluth, South Shore and Atlantic Railway, which invites us to enjoy the beautiful region it has 11 rescued from the wilderness and is now offering

to the people; the people who are undertaking the mighty task of nation-building, as well as the people who seek health or rest or Nature's loveliest phases.

Popularity called “ The Short Line, “ it bears a happily chosen name, as is shown by the straight line you have drawn on the map. We have all read of the manner in which a mighty Tsar called for a map of Russia, and, laying a ruler across it, drew a pencil line straight from one great city to another, saying “Build a road on that route.” We have no Tsar here, but if we had it would be scarcely possible for him to have ordered a more direct highway across the continent than that of which this railway forms a part.

While the map is before you, please note the fact that if you continue that line you have drawn beneath Lake Superior, and push your pencil across the continent, it will pass through Fargo and Bismarck and Spokane Falls, and will dip into the Pacific Ocean at Seattle and Tacoma; for you will have unconsciously drawn the route of one of the transcontinental railways. Go back now and push the line eastward, and you will run it through Montreal. You cannot parallel that pencil mark anywhere else

upon the map and find anything like so straight a route that railway men have previously marked upon the actual face of our country with their enduring lines of steel. The Duluth, South Shore and Atlantic Railway was needed to complete that perfect consummation of the traveler's ideal, to connect the East and West, *directly,* without those irreparable losses that most railways are obliged to cause their passengers by unavoidable indirectness.

By way of Montreal, in the swift, gliding palace coaches of the Canadian Pacific Railway, the traveler from Boston or New York will easily convince himself that, though his cities are off this great transcontinental highway, his loss of time in reaching it is vastly less than he will suffer by taking any other route. Though it is no part of my pleasant task to speak of any other than the magnificent region along the south shore of Lake Superior, I cannot keep from my mind the memory of the really wonderful novelties and delight that I enjoyed in making just that journey piecemeal from ocean to ocean. In Canada the way

runs through a country new born to the influences of civilization, a region of woodland, lake and stream, the reservoir whence the great lakes draw their supply. Then the majestic stretch south of Lake Superior, incomparable in its scenic and its sanitary qualities, new born also, but born to the mighty and progressive force of American enterprise, and fairly throbbing with the activity of its development.

The eastern man who journeys through the West does not draw a favorable comparison between the diversified, picturesque and often romantic scenery of the thirteen original colonies with the mighty monotony of the plains or the bare hugeness of the western mountains. But on the south shore of Lake Superior, be he now prejudiced he may, he realizes that in this great boudoir of Dame Nature there is both the variety and the 12 witchery of his own familiar climes, blended often with a boldness and majesty that it will puzzle him to try to parallel nearer the Atlantic region.

And so he passes on to the imperial prairie, where he will obtain food for town, sprawling thousands of wooden houses upon miles of the sea of grass. He will not say with Cleopatra, “Give me to drink mandragora, that I might sleep out this great gap,” but will come back with a slight misgiving about that conceit he has felt as a New Yorker, and will find himself wondering how long it will be before some of those mushrooms of the plains will be demanding their rights to hold future World's Fairs. But before he does come back he will be whirled up the Rockies and over their crests, and will drop into the glory of sun and verdure on the other side, to find that the straight line he has been pursuing across the continent needs only just a little bending down through the Willamette Valley to terminate it at San Francisco.

A wonderful line, that! A wonderful journey!

THE JOURNEY. FROM SAULT STE. MARIE TO DULUTH.

This new railroad that bids for the favor of the most fastidious public is second to no medium of transportation in the world in any of the particulars that go to make the comfort, the safety or the economizing of time, which must ever be the excuses of corporations for building new lines and of the journeying public for patronizing them. It is at Sault Ste. Marie that we first find its iron steeds hitched to the palatial coaches of the age we enjoy.

Quaint Sault Ste. Marie, young only to those who know not it nor history,

SOO CANAL IN THE LOCK.

but known to us who read as dating back 223 years to A. D. 1668, when Pèr Marquette founded the settlement oftenest called “the Soo” for short. It happened once that I was on a railroad in Ontario and heard two commercial travelers continually repeating a tender feminine name as lovers are said to linger on the name of her whom they hold dearest of her sex. “I'm going to you,” the other said the one. “I envy you,” the other answered. Imaginative by nature, I all but fell to dreaming of the happy lot of him who seemed to be rushing to his beloved's presence. But, alas! it was Sault St. Marie, the city, of which he spoke, as I found later when I heard others call it “Susan Mary.”

Everyone knows how the words should be pronounced, of course. In French, which we are not, “So Sant Ma-ree;” in English, which we speak, “Soo St. Mary.” It is there that the “Soo” is found in the shape of falls or rapids in the St. Mary's River—whence the name. The Gateway at once to the isle-studded. Huron and the lordly Superior, it is a narrow but busy pathway for the keels of the 14 two countries, whose hands, ever-reaching toward one another, seem here almost to meet in the clasp that symbolizes the unity that many predict must sooner or later be brought about.

The principal connection by which the tourist reaches or leaves Sault Ste. Marie is the Canadian Pacific Railway—the most direct and most superb route to and from all eastern points. This line follows the river and lake shore for miles, with only a short portage

between the waters of Lake Nipissing and “Utawa's flowing tide,” and forms a very picturesque route to the eastern sea-board. The tracks of “the Short Line” and of the Canadian Pacific are connected by means of the great International Railway bridge built at an expense of over half a million dollars. At Sault Ste. Marie, also, connection is made with the steamship lines for all points on Lake Huron and the Georgian Bay, with the Lake Superior Transit Co. for Buffalo; the Lake Michigan & Lake Superior Co. for Chicago, and the boats of the Delta Transportation Co. for Mackinac, Cheboygan and Petoskey.

SHOOTING THE “soo” RAPIDS.

SAULT STE. MARIE has several fine hotels, from whose balconies the visitor can watch the roaring, dashing, foaming rapids, with genuine Indians in the foreground, who, in their light canoes, skillfully dip the shining white-fish from its element. These Indians boatmen, hailing from a reservation near by, derive an income by renting their canoes and their own skillful services toward a sport which for dash and exhilarating effect cannot be excelled —“shooting the rapids”—an experience never to be missed and always to be remembered. It is a trip having more apparent than real danger. The Indian pilots have spent their entire lives on and about the rapids, know almost every rock in them, and so skillful have they become in the use of their paddles, that not one accident is recorded. For those who love fishing there is good sport with the rod on these excursions, for very fine large lake trout are plentiful.

The lake boats—carrying a commerce greater than threads the Suez Canal, and continually in sight of the tourist as he sits on his hotel piazza or walks the walls of the greatest locks in the world—are a source of unfailing interest and instruction. The locks in the foreground, the foaming rapids, the Canadian Islands beyond, with rocks and evergreens striving for place, the old Hudson Bay Company's trading post, and rising in the background the Canadian hills, emerald and bold, make a landscape well worth seeing and certain to be enjoyed.

During the summer season there are almost innumerable excursions to be taken from the Sault—to Bruce Mines, to Point aux Pins, to Garden River, to Little Rapids, and last, but not least, to “go fishing.”

FAMED IN HISTORY.

We have heard of places that were called cradles of history, but this and the other forts and posts of Michigan were in a region that may not at all irreverently be called a whole nursery of history. What other section of the country can claim, as this justly 15 claims, to have borne the brunt of two wars? It is worth the while of any American to pause for the moment we shall spend in considering what part in the making of America this remarkable district has played.

Though Marquette founded the settlement, he was not the discoverer of the region. According to the traditions of the Ojibways, the French traders (*courreurs des bois*) reached here ahead of the Jesuits. The missionaries first saw “the Soo” in 1641, and named them the Sault de Gaston, in honor of the younger brother of the King of France. In 1660 Father Mesnard passed up the rapids into Lake Superior. Claude Dablou and James Marquette arrived in 1668 and founded a mission among the Indians, calling it Sault Ste. Marie. Thus it claims the distinction of being the oldest town in Michigan. In 1689 the mission was abandoned, owing to the growing importance of Mackinac as afar-trading centre.

In 1750 the French Governor of Canada, Jonquiere, gave to Captain de Bonne and Chevalier de Repentigny a grant of land bordering upon the rapids and river Ste. Marie six leagues, on condition that a palisade fort should be erected. This was built, and a farm was cleared and stocked with cattle. The chief purpose of the post was to prevent the Indians of Lake Superior from going down to Oswego, where they received presents from the English and were being seduced from their allegiance to the French. It had hardly been completed before the French and Indian war broke out, and Bonne and Repentigny left the

post in charge of Jean Baptiste Cadeau. Upon the surrender of Mackinac to the British, in 1762, a detachment under Lieut. Jeannette proceeded to take possession of the post at the Sault. He met with no opposition, but as, in December of that year, fire destroyed the whole station, Cadotte was left in undisputed possession. During the Pontiac conspiracy Cadotte was friendly to the British, and his wife, who was of unusual force of character, prevented the recapture of Alexander Henry, the only Englishman who survived the massacre of Old Mackinac.

In 1802 a British post was re-established here. During the war of 1812 a band was organized under John Johnston, at Sault Ste. Marie, to go to the assistance of the British at Mackinac, who were being hard pressed by the Americans. The latter had their revenge, however. The schooner “Scorpion,” in July, 1814, landed a force of infantry under Major Holmes at the Sault. He burned the trading post to the ground. Johnston and his company escaped. Governor Cass visited the place in 1820, and on his recommendation General Hugh Brady was sent in 1822 to found a garrison, which has since borne his name, Fort Brady.

The discovery and development of the mineral resources of the Upper Peninsula of Michigan rendered imperative and urgent the construction of a ship canal around the rapids at Sault Ste. Marie. Governor Mason, in 1837, advised the building of such a canal, and work was begun in 1838. The military authorities, who considered the work an infringement upon the right of the general government, drove the contractors off the ground with an armed force, and work was not resumed until 1853. The contract called for two consecutive locks 350 feet long, seventy feet wide, and with a depth of thirteen feet of water and with proper approaches.

On the 21st of May, 1850, the canal was completed at a cost of $999,802.46, and resulted in adding Lake Superior to that system of water-ways which is the pride of the northern border. Sault Ste. Marie lost much of its commercial prestige as a result, but in 1870 the building of a new lock by the Federal Government gave it a new impetus. This was

completed in 1881, and now a third one has been rendered necessary by the increasing traffic, and Congress has appropriated 16 more than $3,000,000 for its completion. This third lock will be 800 feet long inside of the gates, 100 feet wide and twenty-one feet deep. A pier is to be constructed in front of Fort Brady, and the present pier extended 1000 feet. A power canal is being constructed which will have Lake Superior for a supply basin and the source of a power estimated at over 700,000 horse-power and capable of supplying unlimited power for manufactures.

SOO JUNCTION.—Taking our places in the cars, we find that the verdict of those who have gone before us is true, and that, though we are to penetrate some primitive districts, we shall do so amid those elegances with which the Duluth, South Shore and Atlantic Railway is replete, and which cause men to-day to speak as confidently of the comforts of railroad travel as their grandsires did of the *dis* comforts of stage-coaching. Modern cars, broad-tracked and on yielding springs, a straight and level road, powerful and swift engines, polite attendants and officials—these are the necessary concomitants of the modern railroad, and these are guaranteed upon the present journey. The ride of forty-seven miles which brings us to Soo Junction is sufficient to set the traveler's doubts at rest, and to allow him to prepare his mind for a delightful journey. At this junction a branch bears off to the south-east-ward to St. Ignace and Mackinac, a side journey to be experienced hereafter, for the charms of Mackinac are too seductive to be treated merely *en passant.*

A Logging Camp

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Newberry and the extensive works of the Newberry Furnace Company are quickly passed, and so are those busy stations of the lumber trade, McMillan and Seney.

We are journeying through a region of vast extent as well

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as vast activity in the lumbering business. The camps of the loggers frequently believe and render picturesque the scene in this, which once might have been called the “forest eternal,” but which the swift, unerring blades of the axemen are thinning most portentously. And yet, when one considers the territory that is the field of this industry, all active fear of a failure of the timber supply is lulled to rest. Timber and water, water and timber—these are the alternating, but persistent features of this region. Lakes, rivers, creeks and forests swing by with endless repetition. And let it be noted that no true sportsman who loves the prizes of which wildest nature is most prolific needs many minutes of journeying over this reach of the railway before there will leap to his mind the confident conviction that he is in.

A WONDROUS PLACE FOR ROD AND GUN.

A new field, also—as little depleted and as rich in store of game as any in the United States. The silvery lanes of crystal water in which the trout lurk are astonishingly numerous. The reason is simple. This is the bight of land, or “divide” between two great basins, and there are streams flowing northward into Lake Superior, and as many more following the watershed of Lake Michigan. Trout are very plentiful, and very large and finely flavored. In the larger streams and in the lakes is goodly store of other fish, notable for the sport that must preface their capture or for the delicacy of their flesh, or for both allurements. The muskallonge, monarch and tiger of freshwater denizens, is here found in great numbers and of splendid size. His 18 companions are pike, pickerel, perch and black bass.

For the gun and rifle the prey is notable. Deer, bear, geese, ducks, grouse and partridge lead the smaller quarry, which the sportsmen will find active employment, not in hunting merely, but in bagging. This railroad, so fortunate in following the watershed in this remarkable country, also boasts a resident population possessed of all the facilities for equipping parties of huntsmen and fishermen, and yet not at all inclined to over-estimate the value of their services. At any of the stations named thus far, and at all of the principal ones farther across the upper peninsula, sportsmen can outfit completely. They will find

comfortable inns at the towns and villages, and whatever appurtenances they need afterward, be they guides

or boats, bait, teams or whatever, and always on reasonable terms. The streams encountered on either side of Soo Junction are mainly tributaries of the Tahquamenon River, which flows into Lake Superior; while beyond, around Seney, the streams are tributary to the Manistique River, a feeder to Lake Michigan. These streams are very numerous, and so are the lakes and ponds in the same district. From Seney, by a run of thirty-five miles—as straight as ever bullet sped from gun to game—passing Driggs, Creighton and Shingleton, we come to Munising.

MUNISING AND PICTURED ROCKS.

MUNISING.—The sportsman, the idler and the sight-seer may all be surfeited here, but for the sight-seer is the greatest delectation, since this is the point of debarkation from the train to make the side-trip to the Pictured Rocks. They lie to the northward, fringing Lake Superior. In the other direction a short journey brings a disciple of Izaak Walton to the beginning of a series of lakes and streams that empty into Lake Michigan. The nearest, two miles off, is Long Lake, and seven miles farther is Sixteen-Mile Lake, two famous haunts of game fish. The entire region is well stocked with trout, perch and black bass.

But we are sight-seers as well as sportsmen, and in a stage-coach at the station we are bundled in with a light-hearted company bound upon a four-mile ride to Old Munising on Munising Bay. It is a delightful ride, up hill and down dale, through dense, cool forest and sunny glade; and presently, when the brow of the last acclivity is mounted, there spreads before the view one of the most beautiful of harbors—Munising Bay.

OLD MUNISING is a distinctly drowsy old place that had one era of bustle and briskness and then went to sleep, to find the hand of Time now rudely awakening it to begin a new career of activity. But it is all the better that it is such a place as it is, for no new, fresh painted modern village would suit its surroundings so well. Did my reader ever happen to

come across. “The Castle of Indolence,” so as to be able to note the similarity between the poet's description and this beautiful region of the Pictured Rocks? Read the lines while you are looking at Munising Bay, or when you are sailing leisurely amid the wondrous rocks. 19 You will never forget one or the other afterward, for one is the written echo of the other: A pleasing land of drowsyhed it was, Of dreams that wave before the half-shut eye; And of gay castles in the clouds that pass, Forever flushing ‘round a summer sky: There eke the soft delights that witchingly Instill a wanton sweetness through the breast, And the calm pleasures, always hovered nigh; But whate'er smacked of ‘noyance or unrest Was far, far off expelled from this delicious nest.

MUNISING BAY.

The sheltered harbor, enclosed between high bluffs at the sides and made to seem all but land-locked by the distant, softly-outlined heap called Grand Island in the background, is not only beautiful in a high degree, but, as the artist who drew its picture expressed himself, “it rests you just to look at it.” The chromatic waters of the bay, now excelling and now mimicking the coloring of the clear, bright sky, the quaint old village with its ruins of an iron furnace of an earlier day, the soft island and gentle bluffs—these are all alike invested with an inherent quiet and air of seclusion whose restful influence it is impossible to escape. Opposite the old village, on Powell's Point, is a large and inviting local hotel, and another is to be found on the island beyond.

THE PICTURED ROCKS are “just around the corner,” so to speak, and are reached by and viewed from the decks of the handsome streamers that periodically ply between the village and the dozen-mile series of fantastic cliffs and natural monuments. For those who have time sailing parties over the same route are arranged, and afford participants a new and, some think, a better view than that obtained from the larger vessels.

Constance Fenimore Woolson has written a description of the region that may not be easily excelled. She says:

“The Pictured Rocks stretch from Munising Harbor eastward along the coast, rising in some places to the height of 200 feet from the water, in sheer precipices, without beach at their bases. They show a constant succession of rock-sculptures, and the effects is heightened by the 20 brilliancy of the coloring—yellow, blue, green and gray, in all shades of dark and light, alternating with each other in a manner which charms the traveler, and so astonishes the sober geologist that his dull pages blossom as the rose. It is impossible to enumerate all the rock pictures, for they succeed each other in a bewildering series, varying from differing points of view and sweeping like a panorama, from curve to curve, mile after mile. They vary, also, to various eyes, one person seeing a castle with towers where another sees a caravan of the

THE GRAND PORTAL.

desert; the near-sighted following the tracery of tropical foliage, the far-sighted pointing out a storied fortification with a banner flying from its summit. There are, however, a number of the pictures so boldly drawn that all can see them near or far, even the most deadly practical minds being forced to admit their reality. Passing the Chimney's and the Miner's Castle, a detached mass called the Sail Rock, comes into view; and so striking is the resemblance to a sloop with the jib and mainsail spread, that, at a short distance out at sea, anyone would suppose it a real boat at anchor near the beach. Two headlands beyond this, Le Grand Portal, so named by the *voyageurs,* a race now gone, whose unwritten history, hanging in fragments on the points of Lake Superior, and fast fading away, belongs to what will soon be the mystic days of the fur trade. The Grand Portal is 100 feet high by 168 feet broad at the water-level; and the cliff in which it is cut rises above the arch, making the whole height 185 feet. The great cave whose door is the Portal, stretches back in the shape of a vaulted room, the arches of the roof built of yellow sandstone, and the 21 sides fretted into fantastic shapes by the waves driving in during storms, and dashing up and hundred feet toward the reverberating roof with a hollow boom. Floating under the Portal, on a summer day, voices echo back and forth, a single word is

A SAIL ALONG THE PICTURED ROCKS.

repeated, and naturally the mind reverts to the Indian belief in grotesque imps who haunted the cavern and played their pranks upon rash intruders.

“Farther toward the east is La Chapelle of the *voyageurs.* This rock-chapel is forty feet above the lake, a temple with an arched roof of sandstone, resting partly on the cliff behind, and partly on massive columns, as perfect as the columned ruins of Egypt. Within, the rocks form an altar and a pulpit; and the cliff in front is worn into rough steps upward from the water, so that all stands ready for the minister and his congregation. 22 The colors of the rock are the fresco, mosses and lichens are the stained glass; and, from below, the continuous wash of the water in and out through holes in the sides, is like the low, opening swell of an organ voluntary. A Manitou dwelt in this chapel—not a mischievous imp, like the spirits of the Portal, but a grand god of the storm, who, with his fellow god on Thunder Cape of the north shore, commanded the winds and waves of the whole lake, from the Sault to Fond du Lac. On the chapel-beach the Indians performed their rites to appease him, and here, at a later day, the merry *voyageurs* initiated the tyros of the fur trade into the mysteries of their

MINER'S CASTLE.

craft, by plunging them into the water-fall that dashes over the rocks near by, a northern parody on ‘crossing- the-line.’

“The Silver Cascade falls from an overhanging cliff 175 feet into the lake below. The fall of Niagara is 165 feet, ten feet less than the Silver, which, however, is but a ribbon in breadth, compared to the ‘Thunder of Waters.’ The Silver is a beautiful fall and the largest among the pictures; but the whole coast of Superior is spangled with the spray of innumerable cascades and rapids, as all the little rivers, instead of running through the gorges and ravines of the lower lake country, spring boldly over the cliffs, without waiting to make a bed for themselves. Undine would have loved their wild, sparkling waters.

“The cost of pictures is not yet half explored, nor its beauties half discovered; they vary in the light and in the shade; they show one outline in the sunshine and another in the moonlight; battlements and arches, foliage and vines, cities with their spires and towers, processions of animals, and even the great sea serpent himself, who at last, although still invisible in his own person, has given us a kind of rock-photograph of his mysterious self. In one place there stands a majestic profile looking towards the north—a woman's face, the Empress of the Lake. It is the pleasure of her Imperial Highness to visit the rock only by night, a Diana of the New World. In the daytime search is vain, she will not reveal herself; but when the low-down moon shines across the water, behold, she appears. She looks to the north, not sadly, not sternly, like the old man of the White Mountains, but benign of aspect, and so beautiful in her rounded,p womanly curves, that the late watcher on the beach falls into the dream of Endymion; but when 23 he wakes in the grey dawn he finds her gone, and only a shapeless rock glistens in the rays of the rising sun.”

To the pleasure-loving tourist or connoisseur of Nature's gems, the Pictured Rocks of Lake Superior carry with them an interest entirely unique and excelled by no other wonders of our country not even excepting the Yosemite or Yellow-stone Park.

AU TRAIN.—Back again in the cars for a journey to another lake resort, only thirteen miles from Munising. This brings us to AU TRAIN station and AU TRAIN island, the latter being abundant in other examples of the curious sandstone formations that fringe the great lake as with colored lace work but by the gigantic hands of Nature. You can see the island from the railway, but it needs a personal visit for an examination

AT AU TRAIN LAKE.

of the columns, colonnades, grottoes, caves and castellated effects of centuries of incessant wave strokes upon the rocks. AU TRAIN itself, on the mainland, has a vicinage full of attractions. The hotel and cottages peeping between the trees compose an alluring little watering-place for those who seek merely rest and quiet combined with the ozone of pure air, the safeguard of an equable and delightful temperature, and the stimulus and joy

of beautiful surroundings. But here, also, is the Au Train River, famous as a fishing stream, and making its way by a series of plashing and turbulent cascades, with Au Train Lake only two miles from the station. All this water yields abundant trout and bass, and the bush around it affords good sport for hunters. All the paraphernalia for shooting and fishing is obtainable at the station, and excellent 24 camping grounds for resting places or hunting camps are abundant.

ONOTA is but a few miles beyond, on the line of the railway, and here lies Deer Lake, one of the most enchanting sheets of crystal that reflect the verdure of this beautiful region. Deer Lake is between the railroad and Lake Superior, and is a mile in length and one quarter as wide. It lies shut in by high sloping walls of dense timber, as secluded and quiet as it is beautiful.

Capital is being employed to construct a number of good picnic grounds without injury to the scenery, and already some quaint and cosy lodges add to the picturesqueness of the lake's surroundings. Here is good sport with rod and reel, and in the deep yet pellucid water one may actually see, at times, the tiger-like muskallonge and darting bass whose haunts are there. The great king of all lakes, Superior, is only a quarter of a mile from this silvery basin, and from the northern rim of the lesser bowl and great fresh-water sea expands before the view. Of course, the same opportunities for exercise with the rifle and gun are to be found here, and outfits are as readily obtainable at this as at other stopping places.

One of the forest industries is charcoal-burning, and as the kilns in use can be seen from the cars the novelty of the journey is enhanced. The kilns or ovens are great cones built of fire-brick, and capable of holding immense quantities of wood which is filled in from the top. The apertures are then closed, and as the wood undergoes the process of conversion into coal, steam and smoke burst out of the circles of vent-holes

Vestibule of The Temple

26 in the sides of the cones. The process is interesting, and the sight of a collection of thirty or forty of these ovens in operation is very picturesque.

DEERTON is two miles west of Onota, and here are found the Sable (or Whitefish) River, and three miles south another excellent fishing ground called Whitefish Lake. All this district is noted for the abundance of its trout, and the Carp and Chocolay Rivers, fifteen miles farther west, still further extend the field for sport in the capture of speckled trout and black bass.

CHARCOAL BURNING AT ONOTA.

MARQUETTE AND PRESQUE ISLE.

ON the four miles of road that lie beyond Chocolay the track hems the shore of the great lake, following the curve of Iron Bay; and, constantly increasing to more and more impressive proportions, the traveler sees the great docks, the substantial public edifices, the factories and the beautiful hill-crowning residences that compose the city of Marquette. The city is enthroned in regal state upon a commanding bluff, and the first view of it, as the cars emerge from the deep shadowy forest, startles the traveler, who sees a full-fledged and progressive modern city leap, as it were, out of a vast forest, and without hint or preparation as if it had Lay hid, as sleeps the music of the moon, In the plain eggs of the nightingale.

Marquette, the “Queen City of Lake Superior,” is by all odds the best built, wealthiest and most beautiful city on the south shore of Lake Superior. Like the Biblical ideal, it is “set upon a hill,” or, rather, on high ground, ensuring perfect drainage, and overlooking Iron Bay, a beautiful reproduction of the Bay of Naples, which indents the shore to a distance of ten miles from the main body of the great lake. The streets of Marquette are electric lighted, broad, well paved, and usually bordered with great slabs of serpentine marble or redstone, as bright and clean as the best boulevards in America. Its business blocks are fine, large and substantial. A new opera house block has been constructed at a cost of

$75,000, giving the city the finest amusement hall east of Duluth and north of Milwaukee. The business section of the town is in the “Hollow,” the residences on the circling hill-sides. The correspondent of a New York newspaper says: “I have never seen a more desirable place for a summer home than Ridge Street. It is laid out on a bluff, perhaps 200 feet above the lake, shaded with double rows of young maples and lined with cottages of modern architecture interspersed with solid stone mansions and square, old-fashioned country seats. Fountains play on the lawns, there are conservatories filled with rare flowers, there are elegant interiors; and yet, a mile away, is the original wilderness, with bear, deer and the great northern wolf in undisputed possession. The highest civilization is in strange juxtaposition with the fiercest wildness. The town has a high-school, housed in a large, well-appointed brownstone building, with primary, grammar and high-school departments efficiently conducted; elegant stone churches, a musical association, two public libraries, several excellent hotels, and a ladies’ literary club which circulates the latest books and magazines.”

What the corespondent really wrote was, that the ladies circulate “the latest books and magazines and several excellent hotels.” There is more in that than appears at first sight. I know several hotels whose owners would like to have them “circulate.” But those hotels are not in Marquette.

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Marquette has above 10,000 population, and this is rapidly increasing; but if population bores you there remain long walks into the forest, strolls by the lakeside, lovely rides and periodical excursions to the trout

MARQUETTE.

streams, magnificently stocked, which may be reached anywhere in the woods by a tramp of from two to ten miles.

The drives from Marquette to Harvey four miles, to Mount Mesnard two and one-half miles, to Collinsville four miles, and around Presque Isle eight miles, are all delightful.

Presque Isle is the name of a high headland two miles north of Marquette. It was deeded to the city by the Federal Government for a park, and is reached by a good macadamized road, built along the beach and encircling the point. In constructing these roads through the forests of noble trees with which the headland is covered, barely timber enough has been cut away to allow carriages to pass each other. On the warmest of summer days one may drive there without being in the least annoyed by the sun's rays and without ever losing the grand view of the apparently limitless expanse of the deep blue waters of Superior. The water appears many shades darker than the azure of the sky, yet so transparent that one may detect the smallest objects in twenty feet of water. In this respect the famous crystal-like depths of Lake George are excelled. How wonderful it is that nothing sullies this enormous mass of fresh water in any of the lakes or their outlet, the St. Lawrence! And yet the water's purity seems greatest in Lake Superior. A teaspoon lying on the bottom at a depth of twenty feet appears its own size; it is in reality magnified, as at that distance it would look smaller through the atmosphere.

But for the improvements above mentioned Presque Isle is almost its primeval self as the Indian knew it. Its shores are rugged sandstone cliffs, broken here and there by the waves into fancifully formed caverns, pillars and arches. The strata are nearly horizontal, and the veins of different colored minerals make a singularly striking appearance. It interested Agassiz immensely when he visited it a few years before his death.

Presque Isles is even a more lovely objective point for a sail or a row than for a drive, and it offers wonderful allurements for the rest and picnic lunch which so pleasantly break in 29 upon a rowing or sailing excursion. From the water there seems to be a gigantic portal —an open door through the majestic cliff; and the Eastern eye that first beholds it and its surroundings is struck with that which I have mentioned before as a Lake Superior peculiarity—that is, the cleanness of the sheer wall of stone, never smothered to half its

height with the rubbish washed down from the top, but rising clear and abruptly out of the pale-green water. Among all the wonders of this fascinating exploration we are making on the south shore of Lake Superior we shall see few spectacles so impressive and beautiful as this.

This spot was once the site of a flourishing Indian village of the Chippewa tribe, and as these Chippewas were far removed from their enemies the Dakotas, many of the young braves had never drawn bow or tomahawk in combat. On this account they were tantalized and called squaws by their brethren on the frontier. After enduring this a long time a war party was organized to wash away with blood these imputations of cowardice. Before setting out in search of their enemies, the party, thirteen in number, appointed a young man as runner to accompany them, watch the result, and, in the event of their destruction, to hasten back with the tidings. They soon fell in with an enemy four times their number. Selecting their ground and directing the runner to take a position from which he could see the battle, they made their onset. They killed twice their own number and then retreated to a place of entrenchment. Enraged at the loss, the enemy pursued, fell upon, and, amidst great carnage, slew them all. The young Indian runner was seen by Governor Cass soon after his return, and the Governor listened with much interest as he recounted the incidents of the thrilling adventure and chanted his requiem song in eulogy of the fallen.

The new electric lighting power dam near the Collinsville mill, which the city fathers of Marquette have constructed, is a typical example of the enterprise which in this part of the West leads mush smaller places to have “whatever's going,” be it electricity or *la grippe.* Marquette has purchased the power privileges and put up a dam at an expense of $30,000, and thus obtains the power for the electric lighting system put in operation during the past year. The Collinsville mill, now fast falling into decay, is said to be the oldest iron furnace in the State, and stands on one of the most picturesque spots of the many that beautify Dead River.

FISHING NEAR MARQUETTE.

“Would that Dead River bore a name less grim, for some of my pleasantest outings have been upon its bank.” So writes a friend of the author. “One day my fiend Phil. invited me out trout fishing on its had waters. Our outfit comprised

30 two lance-wood poles with reels, half a dozen extra hooks for each, earthworms for bait, a preparation of tar, carbolic acid and sweet oil for smearing the face as a sap to the mosquitoes, a basket for the “catch,” stout hob-nailed shoes, and the oldest suit of clothes our wardrobes could furnish. After a ride of four miles through the pine and poplar forest, we tied our horses to the fence of a farm house perched on a bluff overlooking

TEAL LAKE.

the stream. Here we had a pretty woodland scene. The river valley for a mile had been cleared, and was green with clover and wheat fields; while on the bluffs, on either side, the primeval forest still stood gaunt and sombre. We passed up the right bank and at last, where the river impinged sharply on bold bluffs, we climbed the elevation and struck into the dense forest. A perfect tangle it was. Footprints of deer were as common here and in the open as sheep tracks in a New England pasture, and now and then a broad trail through the reeds marked the recent passage of a bear. We were crossing a deep ravine by a fallen tree, and below was as dense a thicket as eye ever peered into. Out of this, as we crossed, came a deep growl, a perfect symbol of ferocity. We agreed that we had no call to explore that thicket, and pushed on, coming out on the river perhaps half a mile above. The roar of the water-fall sounded deep in the forest, and the water flowed swiftly, though it was easily fordable. Here we rested, watching the gurgling water and anon casting a sprig into the stream to watch its bright verdure form a fitting wreath to the lily-like foam as they together floated rapidly down the amber-hued stream.

“Presently we began fishing. The method is to wade down stream in water reaching from your knees to your waist, cast, and let your hook run down with the stream. Phil. crossed over and took the opposite bank. Presently I hear a splash on his side, his reel whirrs, then he winds in, and in due time slips a pound trout in his basket. The next is mine, then he

strikes and loses one. So we go down stream, meeting with varied luck, until, when near the clearing, we compare baskets, and find that Phil. has ten fish and I twenty. This was explainable, as Phil. had broken his rod and left our hooks to beautify the branches of the trees near the bank."

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THE COVE, PRESQUE ISLE. AMERICAN BANKNOTE CO. N.Y.

FISHING FOR THE MARKET.

From Mount Mesnard we have an extended view of the lake and surrounding territory. Immediately below and to the north lies the city, its streets terraced one above another on the rising hill-sides. Iron Bay sweeps its ten-mile circle to the very base of the Mount. Further north Presque Isle stands out in picturesque boldness, and beyond the "Gitchie Gummee" extends until the deep blue of its waters is lost in the opalescent paleness of the horizon. East, south and west hill, valley and silvery stream glorify the entrancing scene.

"Down on the wharf are two

DEAD RIVER FALLS.

33 small frame buildings, beside which are huge reels on which nets are wound. The interiors of the buildings, laden with nests and hooks and lines, tarred rope, barrels of salt, ice boxes, oars, boats and barrels of salted fish, send forth a fishy and tarry odor quite delightful to the landsman. Every afternoon, at about four o'clock, two busy little tugs come fuming and puffing up the harbor and are made fast abreast these fish-houses. The forward hatch is thrown off and the "catch" of the morning is displayed; hundreds of gleaming whitefish, long piratical-looking lake trout, silvery herring, and now and then a sturgeon, just to remind us that we are in Hiawatha's land. The Lake Superior whitefish are perhaps the most delicious scaled creatures known to the epicure. They are caught weighing from three to thirty pounds. The extent of the catch may be computed from the

fact that one firm in Marquette shipped last summer more than a hundred tons of fresh fish, yet the supply does not seem to diminish."

I am glad to be able to give an account of a day on one of these tugs by a clever and observing writer. All who love the water will enjoy it; and yet the information it contains is its more notable feature.

"The tug left between dawn and sunrise. The east was all aglow, and the west dark by contrast, as we put out into the lake. There was a twenty-mile run to be made before reaching the first 'pound' to be 'lifted,' and we found a warm corner in the pilot-house, and with a cigar inveigled the skipper into a chat that in time became unconstrained and confidential. Wonderful lore of the lake we pick up here on the water from the sailors and fishermen.

"This father of lakes, we learn, has his tides, pulsations and heart-beats. We ourselves observe in our evening walks along the curving beach that the waters have sometimes risen, sometimes receded. There are three regular movements of the water, old watermen say—a daily rise and fall, an annual, and a cyclical, the latter occurring about once in twenty years.

"In early winter the lake is covered with fogs, and the constant evaporation so drains its waters that they are much lower in spring than in autumn; but when the snow melts and the river pour in their floods, the water rises, attaining the maximum about the 25th of June. Then there is a constant and permanent recession of the waters, insomuch that in time much that is now covered by the lake will be dry land. In the plain between Marquette and the lake on the north may be seen several distinct ridges, now in far inland, which once formed the shores of the lake. The coldness of the lacustrine waters, we learn, is another phenomenon. In winter the mean temperature of Lake Superior is thirty-six degrees, in summer forty, a difference of only four degrees. This water, too, is chemically

pure, so that all the good people of Marquette had to do to get pure city water was to run a crib out in the lake and pump the water into the reservoir.

“By and by the boat approaches the first pound. The square enclosure forming the pound is set in deep water, and a line of netting leads from the shore or shoal water out to it. The men, taking the small skiff, row inside the pound and proceed to lift the net. The water foams and boils as the latter approaches the surface, and dark backs and fins and gleaming sides flash in the foam. The net is pursed, then lifted bodily, and the contents—a fine assortment of lake beauties, trout, white-fish, muskallonge, suckers and a sturgeon—are emptied into the boat. As we bowl along to the next pound the 34 skipper is led to descant on the habits and characteristics of the lake fish.

“The chief food fish of the lakes, both in quantity and quality, is the whitefish. He has his preferences and idiosyncrasies, which the fishermen, to ensnare him successfully, must carefully study. His food is chiefly snails, slugs and limpets attached to the rocks, so that a rocky bottom is his chosen haunt. In the spring and summer months he retires to deep water and is found several miles from shore. In the fall he comes in close to land, and the nets are often spread from the rocks. The long, slender,

SAW-MILL NEAR MARQUETTE.

fork-tailed trout is the pirate of these waters. What the shark is to the sea he is to the lake—voracious and ferocious. He will eat anything. The fishermen found in one a pebble as big as a man's fist, in another an old hat. A full grown lake trout may weight sixty pounds, and will attack anything but a sturgeon. Trolling for them is a favorite amusement. The muskallonge looks like an immense pike; his food is also smaller fish, and he is also caught with the trolling-spoon. The sturgeon, now, is his opposite; gets his food by suction, like a catfish. His skin is black and smooth, scaleless as a ell's. A great deal of the codliver oil of to-day comes from the liver of the sturgeon.”

MARQUETTE—IRON MINING.

“Some forty-five years ago a party of surveyors running the west line of township 47, range 26, observed strange variations in the magnetic needle, and thereby discovered rich deposits of the richest hematite and magnetic ores. Capitalists from Cleveland and elsewhere came in, opened the mines, built two railroads to Marquette, the nearest port, and began shipping the ore to Cleveland for smelting.” There are now seventy-three mines on the Marquette range which extends thirty miles inland. From forty of these mines 2,634,817 gross tons were shipped in 1889, while the output for 1890 reached the enormous quantity of 4,000,000 tons. Four large ore docks, reaching out into the bay from 1000 to 1600 feet and forty-seven feet above the lake, have been constructed to facilitate the handling of this great traffic. These docks are the scene of intense activity day and night during the season of navigation. Ambitious little switching engines take the ore trains from the yards, whither they come from the mines, and push them out on the wharves. There redshirted “trimmers” swarm on them, knock out the pins that hold the bottom of each car in place, and the twenty-ton loads drop into the “pocket” in the wharf. These pockets hold from ninety to one hundred and fifty tons. At the bottom of each 35 pocket is a hinged *chute* or spout twenty feet long, which is lowered automatically into the hold of a vessel wharfed alongside; simultaneously the door of the pocket rises and the red or blue ore is precipitated into the hold below. Vessels of 3000 tons may thus be located in three hours.

Marquette—A MONSTER SAW-MILL.

Having passed through an enormous lumbering region, if we look for its sequel at Marquette, we shall not be disappointed. Visitors to the pretty lake-side capital will notice an enormous saw-mill by the water side. The idea of visiting it may not occur to most tourists but, they may take my word for it, they will find the visit well worth while, and when they leave the building it will afterward remain pictured in their minds as the abode of a wonderful dragon—a monster subjugated to man's control—that chews up whole

forests and converts them into building material with much less effort than a melting pot transforms metal into liquid. Everything within the mill is done by steam, and that is controlled by the simplest levers. A tree trunk is taken, no man touching it, and hauled against the saws which bite it into lengths and move it along, cutting it as it proceeds, until within two minutes from the time it rested in the water it forms part of one of the piles of lumber behind the mill.

AN EXTENSIVE MINING REGION.

Back in the cars and gliding away from Marquette, we are quickly at the busy lumber town of Eagle Mills and four miles from Negaunee, a city hear the population of Marquette (8,000) and one of the chief mining centres in the great Marquette Range. Here the Chicago & Northwestern R. R. makes connection for Escanaba, Milwaukee and Chicago. Westward again three miles is

ISHPEMING, the largest city on the Marquette Range. It boasts 15,000 population, and a number of attractions that the tourist should not miss. Within a radius of a dozen miles there are many beautiful lakes, nine in all, accessible by well-maintained and picturesque carriage roads capable of affording the lovers of horse-flesh or of scenic beauties many days of pleasure. It is one of the

IRON MINE SHAFT AT ISHPEMING.

important mining regions of the country, and mines are numerous in the neighborhood of both Negaunee and Ishpeming. These are mainly iron mines, though a few are worked for gold, and as the method of “open-pit working” is largely followed here, at such the process may be witnessed without the discomfort or dread of accident which attends mine visiting by means of shafts and galleries far beneath the surface. Teal Lake, which my artist companion has so exquisitely pictured, is one of the beauty spots of this neighborhood.

HUMBOLDT, twelve miles to the westward, is the point of junction for a branch of the railway leading to 36 Republic and the Republic Mine, and four miles farther west is

Champion, the northern terminus of the Milwaukee & Northern Railway—another means of reaching Chicago and Milwaukee.

LAKE MICHIGAMME.

MICHIGAMME has important interests of its own, and some of them possess attractions for tourists, but that which is conspicuously interesting here is Lake Michigamme, one of the largest and most beautiful of the sheets of emerald that bejewel this gem-decked corner of earth. The railroad skirts this lake for several miles. The lake is seven miles long and there miles in width. It is walled in by luxuriant verdure rising and failing upon its hilly rim, and is dotted with pretty islands. Here again is the sportsman's turn, for the hunting and fishing are both excellent.

Close at hand is Nestoria, point of departure for the principal copper region of the world.

THE WORLD'S GREATEST COPPER REGION.

NESTORIA is the starting point of the branch road to L'Anse and the twin cities of Houghton and Hancock, busy mining towns upon a hilly neck or promontory that pushes its great bulk far into Lake Superior. A ride of seventeen miles from Nestoria brings the tourist of the town of L'ANSE which is beautifully situated on a delightful indentation called Keweenaw Bay. The rails cross an arm of the bay to Baraga and thence the course is nearly due north to Houghton, thirty-one miles from the main line. This city is on the southerly side of Portage Lake, and opposite on the other shore is Hancock. The map will reveal to you what the sight of this water does not, that it is rather a strait than a lake, for it separates a great body of land, called Keweenaw Point, from the mainland, 37 practically cutting the promontory in twain. Vessels of the greatest tonnage in the lake commerce find depth and room for navigation through the lake, and as Houghton and Hancock (called “the twin cities of the Gitchie Gummee”) are the ports of this great copper region, from them are shipped the vast and incessant output of that metal, the mining of which is by

far the most profitable industry in the Lake Superior region. “Keweenaw,” the name of this great metal-veined

HOUGHTON.

arm of land, is Chippewa for “portage,” and according to *Picturesque America* it has a mining history older than our civilization:

“Centuries ago,” reads the tale, “its hills were mined, and the first white explorers found the ancient works and tools and wondered over them; when they were tired of wondering they ascribed them to the extinct moundbuilders, whoever they were, a most convenient race, who come in for all the riddles of the western country, and never rise from their graves to say to us ‘No.’ The Chippewas of Superior were full of superstitious fear regarding Keweenaw Point. They believed that a demon resided there, and they dared not visit his domain to procure copper without first propitiating him with rites and gifts; then trembling and in silence, they lighted fires around some exposed mass of the metal, and, when it was softened, they hastily cut off a small quantity and fled to their canoes without looking back. So strong was their dread that for years the explorers were unable to obtain from them information about the Point, neither would they act as guides, although tempting bribes were offered.

Then came the geologist, unwilling to believe that native copper existed in such a locality, but forced to concede the fact when solid masses of five hundred tons confronted them. Gradually they found that this long point held the greatest copper mines in the world, those of the Ural Mountains in Russia sinking into insignificance in comparison with them; and upon this discovery speculation started up, and fortunes were made and lost in the eastern cities in copper stock by men who barely knew where Keweenaw was, as they tossed it like a football from one to another, and jabbered off its Indian name with easy fluency.

Throughout this excitement and 38 after it died away, however, the Point kept steadily producing its copper from the hills until now not only does it supply the whole country, but its wealth is even sent across the ocean to aid the old world.

On Keweenaw are several lakes, among them the lovely Lac-la-Belle of the *voyageurs,* and the north shore of the Point is bold with beautiful rock harbors."

CALUMET and RED JACKET.—At Houghton a transfer is made to the cars of the narrow-gauge Mineral Range Railway for a toiling, up-grade ride to the village of Calumet and Red Jacket. To borrow the excellent and lucid descriptive language of Mr. John M. Talman:

"The novitiate is at once struck by the peculiar appearance of the streams which now gurgle along his way. Their waters are of a nondescript

HANCOCK.

tint, something between a reddish brown and boarding-house coffee, due to their thorough impregnation with copper ore. Hills, hills, everywhere! Up, on and up we continue until a cluster of gigantic chimneys, something like 150 feet in height, looms up to our view from the midst of a scattered aggregation of single and two-story buildings, and sure enough we are "in it"— in Calumet and Red Jacket, practically one town, the location of the world-renowned Calumet and Hecla mine. Only employes of the company are allowed in the mine—recent history recording only one exception to this rule; but by nosing around the surface (easy enough, a couple of our party being journalists, each with "a nose for news" and with eyes and ears keeping open house), what we don't accomplish doesn't amount to much.

"The geologist—him of the attenuated figure, two-acre spectacles and Niagara whiskers —will tell you, whether you are aware of it or not, that the native copper in these diggings takes the form of conglomerates. That is to say, it is mixed with rock, although it is sometimes found in masses, whereas in the generality of mines the copper is discovered

in the form of red oxide or sulphide of iron, as yellow copper ore, or copper pyrites. Here the great cost of reducing ore is obviated, consequently the expense of turning out commercial copper is brought to the minimum. The mine is located on a system of rocks by geologists called 39 the ‘copper-bearing series,’ and by miners dubbed the Copper Mineral Range.’ This conglomerate rock ranges from ten to fifteen feet in thickness, extending to an unknown depth into the earth, and streaked and veined for more than a mile of its length with metallic copper which is so pure that it may be stamped into pennies without the intervention of further processes. At this mine a depth of 3300 feet has been attained.

“The great compound engine of 3000 horse-power—stronger than the two Corliss engines at the Centennial Exposition combined, and being, indeed, the largest engine on the globe—can supply power until a depth of 4000 feet or more has been reached. The vein is penetrated by ten shafts which are connected with galleries 100 feet apart. Work is here carried on night and day, except Sundays, giving employment to 2000 men or mores and supporting the villages of Calumet and Red Jacket, whose combined population exceeds 10,000. The machinery employed in elevating the copper rock to the surface and in pumping and condensing air for the drills is on a prodigious scale and of the most perfect description. The company's stamp mills and furnaces, located at Lake Linden and Groverton,

a short distance from Calumet, constitution the largest single copper plant in the world.

“In 1889 work was suspended for several months in consequence of a most disastrous and all but unquenchable fire in the mine. Business was completely paralyzed, and not a little suffering among the miners’ families entailed; but operations were resumed several months ago, and now scarcely a trace of the recent awful scourge of flame is observable. This mine (which, in passing, is five miles back from the shore of Lake Superior), has been truthfully described as resembling a section of a rectangular city, having ten parallel main avenues, each with its railroad, reaching nearly a mile into the earth and intersected by

about thirty horizontal streets a mile in length. It is a veritable subterranean city, without a parallel in the history of mining enterprises."

AND NOW FOR MORE PLEASURE.

When the return to Hancock is made, as it must be, the tourist will find a first-class hostelry to be the Douglas House, or if the halt be made at Hancock the Northwestern Hotel will be found replete with all modern accommodations and comforts. These two are excellent hotels in every sense of the term. Near Houghton the Douglas Fall will be found worthy a visit. Those who have seen the Bridal Veil Falls in the Yosemite Valley insist that one cascade suggests the other. Also within a short journey from Houghton is the Otter River which furnishes great numbers of the grayling trout or *Thymallus tricolor* . It is said to be the only stream in upper Michigan in which this coveted fish is found. A writer in *Outing* says "that a visitor from a lower latitude will be impressed with the silence he finds reigning amid these deep woods." Doubtless he will see abundant evidences of the presence of animal life, but it is a life hiding in the shadows. Even the birds are songless, and when surprised, as they often are, flit noiselessly out of view. But along the valleys of the streams where the sunlight comes in and all the conditions are favorable to the sustaining of 40 animal life, one may expect to find it abounding. It was so along the valley of the Otter.

"This green and sun-streaked glade was rife With sights and sounds of forest life."

"What a covert for wild beasts the brushy thickets near the stream and the dark woods beyond did present. Side by side in moist places were to be seen the tracks of the deer and of their mortal enemies the gray wolves. Twice we heard the 'long drawn howl' of the night prowlers, and one day as I stooped to drink at a spring, while wandering in the forest, I noticed in the soft earth beneath me the footprint of a Lupus. He had lapped there not many hours before. Two or three places we saw where Bruin had left the print of his moccasin, but neither wolf nor bear gladdened our sight the voyage through. One deer and

one only we saw and that was one evening as the shadows were dropping down, when one carelessly ran bang up against our camping ground."

Between Houghton and Baraga (a lumbering centre) many fine trout streams are passed, while the lakes and ponds in the same section of country contain perch, pickerel and pike.

Concerning this branch with the copper region, from Nestoria to Houghton and Hancock, over which the return journey to Nestoria is now being made, there are interesting facts which were not previously stated and yet should not be overlooked. At Summit the altitude of the railroad is 1170 feet above Lake Superior and almost 1800 feet above tide-water, yet L'Anse only twenty miles distant is but 100 feet higher than the lake. Portions of the intervening road-bed have a grade of 170 feet to the mile, and in the course of that journey the Fall River is bridged by the railroad. A gradual descent is made from Summit to Nestoria,

Douglas Falls, Houghton.

HUNGARIAN POOL Am Bk. Note Co. N.Y.

42 and in that reach of the journey the Sturgeon River is crossed nine times.

BEAR AND DEER, AS WELL AS FISH.

Again at Nestoria on the main line a run of twenty miles brings the train to Perch, at which point the elevation of the road-bed above the lake has been almost imperceptibly reduced to 800 feet. The Perch River which is crossed where it flows fifty feet below the railroad gives the station its name. From Sidnaw, the next station, the trains of the Milwaukee & Northern Railway run to Ontonagon, the oldest city on Lake Superior, and from Sidnaw westward for thirty-one miles the route of the tourist who is metaphorically making this journey with the author leads through an almost primeval wilderness. The word "wilderness" sounds differently to different ears. Let us read how the place itself

appeared to Judge Banta as he afterwards gave his experience and impressions to the readers of the *American Angler:*

“I had managed to pass over the entire ninety miles between Gogebic and Nestoria by daylight, and had thus been enabled to get a view of the country. I had seen but little game, but from what I heard, and especially from the signs seen, I knew that I was in a country abounding in both deer and bear.

“But it was not game that I was after. It was trout, and I think I have written enough to show that in a space of little over twenty miles, I had found a region that would satisfy the most exacting. I think it quite likely that if I could keep the location of this region secret I would do so, but as a railroad runs through it that cannot be done, so I fling the news broadcast.

“I fished four streams within the twenty-two miles, between the middle branch of the Ontonagon and Perch River, and I think I got all of any consequence the road crosses; but I heard of other streams, both to the north and south of the road and accessible from it, where trout fishing is said to be equally as good as in the streams I tested.

“The country is a wilderness, and will be to all intents and purposes for a few years yet. It is an uneven country, its surface being cut up by small streams and occasional swamps. It is a country of thick forests, and dense thickets frequently occur. But the camping ground is good. On the Middle Branch, on Spring Creek, on

A MORNING START WITH THE DOGS.

43 the East Branch, on Perch River, are excellent camp sites, with good water close at hand.”

ONTONAGON FALLS.—At Ewen the train crosses the Ontonagon River as it has crossed many another before, but there are conditions about this particular passage which cause it to be remembered by the traveler even though he forgets all the other rivers he has seen. The first element in the pleasurable experience is surprise; the next and enduring

one is delight over the revelation of beauty that follows. The train leaps, from not at all extraordinary surroundings, out upon a bridge nearly 100 feet above the beautiful stream and seems poised, as a swallow, in mid-air. The Falls of the Ontonagon are in full view. The spray from the falls glistens like diamonds in the sunlight, and the watery veil screens, as with a web of open lace, the features of the rocky

ledge behind it. It is worthy anyone's leisure to stop here and drink in the views of this cataract that are obtainable. It is toilsome work to reach the bottom of the falls, but from there is obtained the best view of them. The railway bridge you have left above you has become a mere thread against the sky. Looking down the stream you see the falls in all their majesty and beauty.

SPORT, HEALTH AND REST AT GOGEBIC LAKE.

Thickly forested the country still remains, and lumbering camps and centres are to be seen to the end of the journey; but something far different from any mercantile industry awaits the tourist at Gogebic. That something is presently to be seen from the car windows. It is Lake Gogebic whose edge the railway skirts for a distance of four miles. The lake is already famous. It must very soon be popular, for it and its vicinage tempt the tourist, gladden the camper-out, electrify the angler, and bring health and good spirits to the invalid.

GOGEBIC LAKE is universally conceded to furnish the best black bass fishing in America.

Close to the station of the same name as the lake good camping grounds are found, but a boat ride of fifteen miles brings a tourist to the Gogebic House and 44 Cottages, a modern and comfortable caravansary, where accommodations are afforded for more than 100 guests. A company is now planning to erect a large hotel at the north shore of the lake convenient to the railway, and to be built and appointed so as to stand without a rival.

The supremacy of the lake as a haunt of black bass has been vouched for by veteran sportsmen who rank as the best authorities from all parts of the United States. A half-dozen trout streams empty into the lake, and during early spring brook trout may be caught in its waters. They abound at all seasons in the tributary streams. There is a steam yacht under control of the hotel management, as well as a large fleet of sailing and fishing boats which can be obtained at reasonable rates, with or without guides. As the lake is fifteen miles long and abounding in exquisite views the pleasures of boating upon it need experiencing rather than describing.

CAN THERE BE PURER AIR?

Aside from its merits as a resort for sportsmen and the general tourists, the vicinity of the Gogebic Lake possesses advantages as a sanitarium, which have given it a well deserved and national reputation. 700 feet above Lake Superior, and yet only twelve miles from that vast body of fresh water, the purity of the atmosphere can be imagined by the reader—at a distance—can be *tested* by the tourist on the spot. Add to this fact that the beautiful resort is in the heart of great pine and hard wood forests. Not only do they further purify the atmosphere, but they temper the air to a quality remarkably soft and salubrious.

These are advantages such as are enjoyed by few other regions accessible by railway, no matter how much has been said in their behalf. The climatic consequences of the peculiar position of Gogebic Lake are such as to recommend the region highly to all sufferers from pulmonary ailments, and sufferers from hay fever or malaria will also find it especially curative. Hay fever is not unknown here, but many afflicted with that complaint have been entirely cured within twenty-four to forty-eight hours after their arrival at Gogebic Lake.

The same writer who has once before been quoted as a contributor to th *American Angler* , said of this lake in an article published in January, 1889: “When I reached my goal I was not sorry that I had made the journey.

45 Gogebic Lake has been too often written about in the sportsmen's papers for me to consume time and space in any description of it in this place. It is enough to say that the new line of the Duluth, South Shore and Atlantic Railway skirts the shore along the north end for a distance of four miles. I went to the Gogebic for the purpose of spending

my time fishing, but somehow I changed my mind after I got there. I saw many persons go out upon the beautiful Gogebic waters, and it seemed so easy for them to hook and haul in the bass that my desire to emulate them eluded me. It was so much pleasanter to sit in the door of the tent and look at the lake. Can I ever forget the dreamy freshness of those days on Gogebic Lake? The green woods, the clear waters, the crisp, balsam-laden breeze, how charming they were and how surely they made me forget the pupose of my coming!”

TOWARD SUPERIOR'S HEAD.

Westward from Gogebic Lake the railway gradually ascends until Thomaston, the headquarters of the western division of the Duluth, South Shore and Atlantic Railway is reached. The way is still through a thickly timbered country and past lumber camps and occasional clearings. At Thomaston the height of the railway above the lake is 750 feet, but thence westward to Duluth the grade gently declines until it and the lake practically meet. At Abitosse, five miles west of Thomaston, the 46 Black River is crossed and a few minutes afterward the train is at Bessemer Junction, where upon a branch road two miles long the traveler may break the westward journey by a stop at Bessemer.

BESSEMER is the central point in the Gogebic Iron Range which marks the eastern limit of the marvelous Lake Superior mineral region where, to quote a better posted historian, “the development wrought during the past five years by the allied forces of energy and capital has attained the proportions of one of the most astonishing revelations on the continent. To begin with, from five millions to eight millions of tons of iron ore are shipped annually from Michigan's upper peninsula. Furthermore, within this territory of 150 miles,

leads of silver have been traced, and that potent lever of civilization and progress, that goal of the ambitious and the restless and the miser's pride—Gold—hidden away among the dark labyrinths of the accumulated mold of countless ages, has here been discovered by the skill and intuition of the prying prospector, as the pure, sparkling draughts of subterranean springs are revealed to man through the discerning instinct of the lapwing. No other section of the American Union is so wealthy as this, whose gold, copper and other mines promise to yield greater riches than those which dazzled the imaginations of the Forty-niners as they fought their perilous way over the continent to the glistening sands of California."

THE FIRST SIGHT OF WISCONSIN.

MONTREAL is the station at which, 300 miles from Sault Ste. Marie, we pass at once the Montreal River and the inter-state boundary and begin an invasion of Wisconsin, happily choosing its most fascinating section.

I cannot claim the inspiration that urged his pen who wrote this part of Wisconsin in the following

47 glowing terms, but I can testify that he had imbibed the spirit of the region or, as the fraternity of artists say, he caught "the local color." Here is the eulogy: "The northwestern quarter of Wisconsin has, from time immemorial, been the modest recipient of more flattery from explorers, hunters, tourists and health-seekers than any other part of the delightful Northwest. In the legends of the 'first families'

FALLS Near L'Anse. Am. Bank Note N.Y.

(the native Indians), in the traditions of the now departed pioneers, in the camp-fire stories of the professional trappers and fishermen, in the ingenious fancies of newspaper men and in the more reliable (and often tiresome) reports of government investigators, such as David Dale Owen and others, the palm of superiority has been accorded this mystic region for its diversified beauty, its charming lakes, stately forests, crystal streams, towering

rocks, mysterious caverns, spray-wreathed cascades, fairy dells and shadowy grottoes; for the beauty and healthfulness of its climate, for the variety and excellence of fish and game —in short, for everything that attracts and charms the lover of the beautiful in Nature."

The first stop in Wisconsin is at Saxon, where the Milwaukee, Lake Shore & Western Railway crosses our steel pathway. In the next reach of the ride the notable "sights" are bred of the crossing of tumultuous rivers upon spans far above their surfaces. First there is Vaughan's Creek, tumbling and plashing seventy-five feet below the cars and suggesting, in a miniature way, the scene at Ontonagon Falls. Two miles farther west the Bad River is crossed upon a bridge that spans its gully at a height of sixty feet. And thus, with another mile of journeying, the tourist arrives at a point where he must decide whether to miss or to see

ASHLAND AND THE APOSTLE ISLANDS.

MASON is the point of departure for this pocket in the skirt of old Madame Superior—a pocket crammed with treats and wonders, not as unguessable as the contents of a human female's pocket (for nothing in the world is to be likened to that), but rather like the pocket of some goddess who is not in any mythology, but who devotes herself to collecting and preserving the odds and ends 48 and broken fragments of Nature's surplusage of charms. Do not miss the lovely scenes. Who hesitates is lost. In something like Shakespere's words in *The Tempest:* Come unto these yellow cliffs With tiny skiffs.

ASHLAND is a place where several railroads centre, and you see by the mills along the shore and the great fleets of logs the tugs are forever towing down the magnificent natural harbor, that there is plenty of material for prosperity here. It is being well utilized, for ASHLAND is one of the most ambitious and energetic towns on the line. From the verandas of the Hotel Chequamegon, exquisite views of forest and water may be obtained. Delightful and well kept grounds add to the natural attractions of the place, which offers active pleasures in abundance. If one wants a sail or a row on the bay he will find any

number of boats of all degrees of capacity and stylishness at the piers. There are boys there, too, to furnish that “stiff ash breeze” which the old sailor once said a row-boat has to have. Or one may join some of the excursions going to Bayfield or out among the Apostle Islands on the natty little streamers that make the delightful voyage at all hours of the day.

APOSTLE ISLANDS! How the name brings back thoughts of the missionary pioneers. Father Marquette himself, “the central figure of the lake country history,” spent some time here on Madeline Island, one of the twenty-four which form a lovely archipelago in the beautiful contrast with the stern coast to the north and east. An antiquated Roman Catholic chapel still stands at La Pointe. It was built of rough hewn logs, and is now used as an adjunct of the newer structure. The chief object of interest in the room is a famous old picture that hangs over the altar, and that is only interesting because of a tradition to the effect that it was brought from France by the adventurous priests, whose zeal led them to this wild region. Some judges who fancy themselves competent, have pronounced it a product of some “old master,” but it is more reasonable to suppose that it has no merit unless it has procured it as wine does, through age.

The bay and the islands beyond are opulent in picturesqueness. Clean cut promontories crowned by lofty trees shoot out into the emerald and crystal depths, and in spots along the shores the action of the waves has created a series of caves, arches, colonnades and pillars whose details human skill might copy, but whose beauty artifice has never matched. Numerous pleasant little excursions to interesting and picturesque points may be taken from Ashland, above all a visit to the falls of the Bad River.

MORE SPORT WITH ROD AND GUN.

Duluth is reached by returning to the main line at MASON, and after a ride of nine miles Pike River is come upon and the train bowls along beside PIKE LAKE —a bowl of water that teems with black bass. A large and fine hotel is an addition to the equipment of this beautiful resort, which, taken with the fact that it is only fifty-five miles from Duluth and but

a few hours' journey from St. Paul and Minneapolis, makes certain the present promise that the region will increase in popularity. Eleven miles west is crossed the Iron River, a famous and heavily fish-burthened sportsman's haunt.

It is an heavily wooded, rolling country whose surface the cars of the DULUTH, SOUTH SHORE AND ATLANTIC RAILWAY are nor gliding over. Every here and there one gets either glimpses of little streams that glint in the sunlight or of exquisitely forest-embowered rivers and ponds and lakes. One of these bodies of water is the Brule River, not to know which argues yourself unknown. It is the king of the trout streams of the region—we may say of the Union. 49 For a distance of 150 miles the water swarms with the finny beauties, and only twenty miles of the great recreation ground is private property. "Only twenty miles," we say, because it happens that the St. Louis sportsman who came there once, a fishing-and a-gunning, and who fell in love with the region bought only a twenty-mile patch river with river flowing through the middle of it. Why he did not buy it all we cannot determine any more than we can decide why men who have money enough do not combine and buy the whole earth, giving the rest of mankind the privilege of emigrating to the moon. On beyond, three trout streams, the Middle, the Poplar and the Aminicon Rivers, offer unlimited sport for fishermen and room and pleasure for camping parties. When the Nemadje River is reached the tourist is within two miles of the "Minnehaha of Wisconsin"—the falls of the Black River. Their plunge from summit to base is above 150 feet. The name of the river we have mentioned—"Nemadje"—means the left hand, and signifies the river at the left hand of Superior Bay as one enters the bay from the lake.

THE SUPERIORS.—The end of this division of our journey is now close at hand. The clanging bell of the locomotive gives tidings of our arrival at what is called " OLD SUPERIOR," to distinguish it from the proud "younger twin," WEST SUPERIOR, four miles beyond. "These towns lie upon the south shore of St. Louis Bay, with Superior Bay on the east. WEST SUPERIOR presented the most extraordinary of all the wondrous records of rapid growth which were gathered for the world by the federal census of 1800. What was this ratio of increase in the decade from 1880? Fourteen thousand per cent! Hadn't

forgotten it, had you? If so, here is the explanation: In 1880 there was no West Superior. In 1890 there *was,* and in 1891 there *is;* and Robert P. Porter's enumerators reported the populations, in round numbers, at 14,000."

THE SUPERIORS possess extraordinary natural advantages. With two rivers, three bays, a superb landlocked harbor seven miles in length, and a level, gently sloping site at the end of deep water navigation in the heart of the continent, what better can any youngster amongst our cities boast or want? West, south, and east lies a region watered by rivers and lakes

teeming with fish of all kinds, from the: speckled beauties" to the thirty-pound salmon trout, while the forests remain plentifully supplied with deer. The Indian hunters and trappers derive a considerable income from the sale of the skins of many kinds of game.

Many legends pertaining to the history of the Indians dwelling in this locality is uncommonly interesting. It appears that the Chippewas imagined the home of the Bad Manitou to be at the gateway to Superior Bay. Because the currents of the bay and of the lake conflict just there and keep the water constantly, through not violently disturbed, they fancied that the evil spirit kept house in or under the water just at that spot. They knew he made trouble everywhere, and the 50 unexplained disturbance in the water was therefore a certain that this was where he lived. In order to satisfy the demon they never passed that spot in their boats without dropping their valuables into it as a peace offering. By their valuables I mean tobacco, pipes and whatever edible delicacies they had.

How they expected the Old Harry to smoke soaking wet tobacco I don't know, but he evidently was not the same chap that wer are familiar with, who has positively no liking for water at all. Besides, our Bad Manitou rather helps those who want to go to Canada. At all events, when the Chippewas felt too poor to bribe the Evil One, they used to swindle him by carrying their boats over a portage at a narrow strip of land that confines one side of the bay. I suspect he was the grandfather of our Davy Jones, whom all the sailors fear,

because the real genuine proprietor of Hades certainly always spent most of his time ashore—and does now.

THE DELIGHTFUL CLIMATE.

The climate, not only here but throughout the entire region we are about to traverse, is most delightful. Summer does not linger in the lap of spring; in fact, in this realm of uncontaminated nature, Miss Summer knows no such dubious practices. Instead, she bounds away from cross and chilly old Winter, and a loveliness that is indescribable, she shakes out her green tresses and decks herself with flowers, so as to more than make amends for the length the world has endured the season of snow and ice.

Snowshoe Island

Nowhere, unless it be in England, is the summer so luxuriant and opulent as here. The air, too, is not only soft and balmy, but it is spiced with the tonic of the woods.

Here twilight lasts in summer until ten o'clock, with soft luminous tints along the northern horizon, beautiful beyond description, but exercising a bothersome influence upon children from the East, who can never be persuaded that it is bed-time until the hours have gone more than half-way toward midnight.

“LONG LIFE AND GOOD HEALTH.”

We are on the eastern shore of St. Louis Bay, with Duluth's reflection dancing and nodding its beckoning towers and walls invitingly. And cross we must, like so many Leanders, without any fleshlier queen than a royal city to embrace us. But ere we commit our bark to the weaves let us stop and reflect upon the health-insisting qualities of the pure balsamic air, clear water and clean land that have surrounded us for hundreds of miles in an ever-moving circle.

Mr. Talman asserts (and many a thousand men vouch for what he says) that hay fever can no more enter this region of which Duluth is the capital than rheumatism can find refuge in a statue. He writes thus feelingly of his reasons for speaking with authority upon the subject: “Eleven years has he been doomed to suffer annually for six weeks, more or less, the torments of the—darned; sneezing without stint, eye-smarting without mercy, wheezing without relaxation, handkerchief-using without limit, and swearing—no, no, no! not that, but wanting 51 to swear—without cessation.” Not the minutes iota of comfort had he been able to extract from life until he learned that hundreds of hay fever patients flee to Duluth every August for immunity from that frightful scourge—doubly frightful by reason of its frequent diabolical partnership with asthma—and immunity they secure every time. Neither at Duluth nor at any other point on the south shore has hay fever ever gained an instant's foothold.”

DULUTH—ZENITH CITY OF THE UNSALTED SEAS.

DULUTH. —In growth, in the character of her population, in commercial enterprise and success “the Zenith City” has exceeded the bounds of many a boast that a few years ago served only to raise ironical laughter in the East. “Co-operating with Minneapolis, Duluth has wrenched the sceptre of supremacy as America's great centre of the grain trade from the desperate but no longer availing grasp of Chicago. This stupendous feat, high on the list of yesterday's sheer impossibilities, is one of the indubitable, everywhere-conceded, fully consummated achievements of today.”

It is a hustling, clean, thriving city, and one in which you miss entirely the braggadocio with which less solid cities in the West endeavor to make boasting hide a lack of merit.

It is al curious fact about so pushing a city, but Duluth's attractions as a summer resort have spread the city's fame far and wide within the past two years. With its delightful climate, where the mercury kindly limits its parade between sixty and seventy-five degrees during the hottest days of summer; with its cool evening breezes that bring invigorating

sleep; its remarkable scenery of woodland, lake and hill; with its eccentric water-courses and its abundant sport—especially for fishermen —the only wonder it that its frame should have been so tardy.

The numerous small streams along the north shore furnish the best kind of trout fishing. The delicious lake whitefish need no praises here, and of late the frame of the planked white-fish, as that dish is served in the Spalding House, is co-extensive with a knowledge of good living. Feathered game is plentiful the year round, and along the St. Louis River, as well as far back in the tangled wildwood, deer are still found in great numbers, in spite of the advancing sound of the woodman's axe and the ravages of the sportsman's rifle.

Duluth's hotel accommodations are not excelled by those of any city of its size in the world.

The city takes its name from a corruption of the surname of a noted Frenchman, Du Lhut. It stands on the north shore of the bay, at the extreme western end of the great chain of lakes, 1750 miles from Quebec and 1200 from Buffalo. Although in age it should be almost a baby in arms, it has 50,000 inhabitants, and is not only called but is the “Chicago of Lake Superior.” Its natural situation is picturesque in the extreme. From a narrow beach abrupt

hills rise to a height of 500 feet. Upon the summit of the ridge thus formed and on what must have been the former level of the lake is a natural road-bed 100 to 250 feet wide, which local enterprise has transformed into

A PORTION OF DULUTH.

53 Terrace Drive, giving limitless views of the bay, the majestic lake and the surrounding country.

Nothing about Duluth is more beautiful or more surprisingly unexpected to an Eastern visitor than this grand drive. It and the others that connect with it are really what we in the East call “parkways,”—those evidences of high civilization which

the older cities, after one or two centuries of growth, do not exhibit in better form or greater extent than are found to be possessed by this baby metropolis of the West.

The quick public spirit that led to the expenditure of enormous sums on Duluth's Terrace Drive cannot be too much commended. It evidences a regard for something beyond money-getting and a faith in the old adage that applies to cities as well as men— “All work and no play makes Jack a dull boy.” This drive gradually ascends the stately ridge behind the city, whence a superb view of both city and bay is commanded. Several times the pretty course of the massive and well built road is interrupted by natural cascades and ravines spanned by beautiful bridges. If Terrace Drive is second to anything of the sort in America it can only hold that status in relation to our Riverside Drive in New York, and in truth, it is as well made, as wide, and the contiguous scenery is a close second to our views of the Hudson and Palisades.

The ravines and cascades which so enhance the beauty of the driveway are accounted for in the fact that a few miles back of the hills are numerous lakes and streams, and the latter follow their courses to the brow of the ridge. Thence they dash downward through the heart of the city, leaping and tumbling over rocky beds in innumerable and beautiful water-falls and cascades, reaching the shore of the lake at last there to mingle with its waters their spent floods. On either side of these streams are deep ravines, some wild and rugged and others sloping gently and thickly studded with trees. Advantage is being taken of these natural formations to establish a system of parks which promises to be the most picturesque and unique in the world.

SCRAPS OF EXPLANATORY HISTORY.

St. Louis Bay, separated from the lake itself by a narrow strip of land, or more properly two, called Minnesota and Wisconsin points, forming a natural harbor of many miles in extent, was first visited by civilized men in 1632 as nearly as history records. In 1641

Fathers Daniel and Breboeuf were invited to visit the lake but came no further than Sault Ste. Marie. The first white men to leave an actual reference to this territory were Pierre D'Esprit (Sieur Radisson) and Madard Chanart (Sieur des Groselliers) in the fall of 1661. In 1667 the Jesuit Father, Claude Allouez, mentions his visit to the head of the lake, accompanied by several traders, and from 54 this time forward a rich traffic in furs was carried on.

In 1679 Daniel Greysohlon Du Lhut came to the head of the lake with a band of *courreur des bois,* making his headquarters in this neighborhood for several years. There is a conflict of evidence as to whether Du Lhut or the Hudson's Bay Company first established the old trading post on the south shore of the bay, but in 1787 the Hudson Bay Company's men were driven away by the newly formed Northwest Company, the great trading company which was succeeded by John Jacob Astor's American Company after the act of 1816, after which the Americans controlled everything in this vicinity. The early settlements were not where Duluth stands but on the opposite shore.

Westward from Duluth are the DALLES OF THE ST. LOUIS, of which another writer says: “Here Nature is harsh, rugged and sombre, tearing her way in a water-course four miles long with a descent of 400 feet. The banks are formed of cold gray slate rocks, clad with an ample growth of bleak pine, and twisted, split and torn into the wildest shapes. Through the dismal channel thus bordered the current surges with terrific force, leaping and eddying, and uttering a savage roar that the neighboring hills sullenly reverberate. Here and there an immense boulder opposes, and is nearly hidden by the seething, hissing, foamy waves, which dance and struggle around and over it, sometimes submerging it, and then, exhausted, falling into a quieter pace. Occasionally the spray leaps over the banks, and forms a silver thread of a rivulet, which trickles over the stones until its little stream

ALONG TERRACE DRIVE—DULUTH.

tumbles into the unsparing torrent again and is lost. This continuous rapid of four miles is a grand, deeply impressive sight.”

A BREAK—AND A RETREAT.

“Forward and back again!” the dancing masters shout, and if we may perform such an antic in dancing why not in sightseeing?

A few hours in the cars after leaving Duluth brings us to the great Twin Cities of the Norwest—St. Paul and Minneapolis.

On our return journey we bid adieu to the main line to the Duluth, South Shore and Atlantic Railway

NEAR DULUTH. Am Bank Note Co. N.Y.

at Soo Junction and embark upon the St. Ignace Branch bearing off to the southeast for a spin.

TO LOVELY MACKINAC.

ST. IGNACE is the terminus of the branch from Soo Junction. It has a population of 3000 souls. Its busy iron furnace gives present realization of industry and gain, but there is promise of greater prosperity in the extensive deposits of gypsum that have been found there. At St. Ignace was buried good old Pére Marquette, the missionary, whose mortal dust lies in a great square burial plot distinguished by a plain granite shaft. No more appropriate burial place could have been chosen than one just here, in the centre of the vast region that was the scene of his patient life work, and whose rude people left the influence of his exalted character.

St. Ignace and Mackinaw City are opposite each other, divided by the Straits of Mackinac. At St. Ignace a powerful steam ferry transfers the solid train across the Straits of Mackinac, landing us in Lower Michigan, where connection is made with the Michigan Central and Grand Rapids and Indiana Railroads for Cheboygan, Petoskey, Detroit,

Niagara Falls and all the eastern cities and resorts that most of us are at once fleeing from, and yet reluctantly approaching.

As the ferry steams out into the Straits, there is seen on the left a “mound of emerald heaped up in a sea of turquoise”—an immense, turtle-shaped island rising from the lake's embrace 300 feet in the air, clothed in the vivid green of tree-leaf and grass-blade, and formed, as the beach and winding roadways reveal, of a soil nearly as white as chalk. It is Mackinac—“The Classic Isle of the Historic Straits”—the first view of whose majestic beauty indelibly stamps upon the perceptions of the new comer a picture of blended splendor and grandeur that well becomes the most popular and fashionable watering place west of the Atlantic.

MACKINAC ISLAND AND ITS APPROACHES.

57

MACKINAC!—Lest the reader trip and again stumble over the varying spellings of the word, let it be noted that “Mackinac” and “Mackinaw” are both pronounced alike. It is a characteristic French trick to gallicize the words of any language they touch, and all over the West where they had early mission fields they thus spelled words one way and pronounced them another in a way peculiar to their own language and maddening to the blunt and practical Anglo-Saxon mind. The Indians doubtless pronounced the word “Mackinaw,” but the French could not have been expected to spell it as it was pronounced, so they invented Mackinac. Later, we Americans gave the right spelling to the name of Mackinaw City. But remember that the name is always Mackinaw, no matter how it is spelled.

Mackinac Island lies like a broken link between upper and lower Michigan. Around it meet the waters of the two great lakes, Huron and Michigan, whose level is 581 feet above the sea. The island has sufficient area to cause a journey of nine miles in skirting its shores, yet we may practically walk all over it in a day. It is shapen as if it had been made square,

and then some giant force had pulled each of its corners a little away. It rises sheer above the translucent waters, a great plateau, 200 to 300 feet in height, wooded luxuriantly and framed with a broad white beach. Its sides are cliffs, and many of them have detached or semi-detached bits that take the form of pinnacles of half-ruined Gothictowers. It is evident that the water once stood 250 feet higher up than now against these cliffs but, as similar indications are found all along the south shore, it is plain that the land was not lifted up, but the water has fallen.

As is the custom with old villages, wherever they are seen, the little original settlement crouches at the foot of the bluff beneath the fort—a straggling, picturesque settlement of shops and cottages, churches and hotels, facing the white strand and the marvelously clear water. As is also the custom with the wiser planning of mankind to-day, the far choicer high ground is being built upon with modern hotels and lovely villas. Up there, also, is the military reservation of 103 acres, and the remainder has been set apart by the Government—justly appreciating its unique attractions—for a National Park.

FIRST CLASS HOTELS.

In the hotel accommodations will be found service for the luxurious as well as for folks of plainest tastes and moderate means. The leading hotel is Plank's Grand, an establishment comparable with any on the continent. The “Grand” towers above a high bluff on the westerly end of the island, commanding a superb view of the Straits of Mackinac, whence comes an almost unintermittent cool breeze. The majestic building is the first object on the island apparent from the decks of incoming steamers.

The hotel is new and modern in all its appointments, having been built at a cost of $300,000 in the 58 spring of 1887, to accommodate 1000 visitors. It is the finest caravansary in the north. The “Grand” is 650 feet long and five stories in height, surmounted by a fall tower, from which an expansive and uninterrupted view may be obtained. The architecture is of the “Old Colonial” style, its distinctive feature being a

colonnaded portico, upon which all the windows open. This portico or veranda is twenty-two to thirty-two feet in width, and extends the entire length of the house, forming a magnificent promenade.

From the large rotunda office opposite the main entrance, spacious halls, running the length of the building, lead to the breakfast room, dining hall and ordinary on one side, and to the reading and drawing rooms, and private parlors on the other. Of these apartments, especial attention is called to the dining hall, a mammoth brilliantly lighted and perfectly ventilated room, capable of accommodating 600 people. It occupies the space of two stories, its vaulted ceiling being twenty-seven feet overhead, and the handsomely decorated windows in proportion.

The guest rooms are all large, light and well furnished. Each front suite is provided with a private balcony, a novel but highly attractive feature.

The hotel is lighted by gas and electricity, heated with steam, and provided with an elevator and electric call and fire-alarm bells. It is also equipped with barber shop, bathrooms, steam laundry and a first-class livery, and last two enterprises under the management of A. Fisk Starr, known to fame as the genial charioteer of Mackinac. An orchestra discourses music during meal hours and enlivens the veranda and ball-room in the evening. The Casino, at the south of the hotel, furnishes all desirable indoor amusements. The “Grand” is close to the edge of the bluff, and the descent to the beach is about 300 fee, pleasantly made on a rustic staircase.

There are several other good hotels on the island, the leading ones being the Mission House and the John Jacob Astor House.

Having decided the manner in which you will be housed during your stay, the next point is to consider how you will spend your time: What are the

GRAND HOTEL.

attractions? Will your holidays be agreeably passed?

“THERE IS NO PLACE SO HEALTHFUL.”

Lieut. Greeley, the Arctic hero, in an article in *Scribner's Magazine* entitled, “Where shall we spend the summer?” names Mackinac as preeminent in possessing the cool, dry bracing air necessary to health, while ex-Surgeon-General William A. Hammond, the famous specialist, long of New York and now of Washington, writes that “There is no place so good in every respect for the exhausted city worker of the East, the banker, the merchant, the professional man and his wife and children—who have probably in their way worked as hard as he has—as the Island of Mackinac.

“Every breeze that comes to it blows over the water and parts with its surplus heat. The air is dry and bracing; the middle of the day warm 59 for two or three hours; the nights cool and invigorating. There is not a bad smell in the island; not a mosquito nor any other kind of pestilent insect. I found all this out when I was stationed there as medical officer a year on the strength of my recollections of more than twenty-five years ago, and as the result of my experience, I am going there again this year. I have no hesitation in saying that it is the best summer resort of which I have any knowledge for persons whose nervous systems are run down, or who desire to be built up and strengthened.

PLEASURE FOR EVERY PALATE.

Mackinac offers as many ways of killing dull time, or making dull time gay, as any American resort, and when I say that I am aware that there are as many appetites, normal and false, as there are possibilities of satisfying them. I remember once in one of those fugitive, chance meetings that occur between men on long railroad journeys (and to which the ladies are and must be stranger), the conversation turned to a discussion of the greatest pleasure in life. A very young man said that, if he could choose the very best fun

in the world, it would be a winter's straw ride in the country with his old companions and sweethearts, terminating with a dinner and a dance, and a moonlight journey home.

A very red-faced old man smiled contemptuously at this, and said, “A dinner! Heaven defend me from a dinner such as you would get. It would consist of ham and eggs and milk and doughnuts—sudden death in four courses.” What he enjoyed most keenly, he said, was a canvasback duck cooked as it can be cooked only in Baltimore or Washington, and enriched by a bottle of Chambertin.

“Pshaw!” said a dandyish man, with steel-gray hair and clothing that bore the London stamp; “give me my yacht and half a gale astern, and give me all the sea room I want. Then, as the boat careens and dips her rail in the sea, and the spray flies and the sail strains, I'll throw myself on the back, pipe in mouth, upon the deck, and never will man dream of greater pleasure than mine.”

“And yet,” said a commercial traveler, “perhaps I'll be to-night where I shall pale your sensations into nothing. If I meet the men I expect to, we will gather around a table and have a little game of ‘draw.’ Nine-tenths of the game will be insipid, but there will come a moment when I

will have a splendid hand; a partner will fancy he has a better one. We will put our hands against each other. The other players will draw 60 out—you know the rest. I would not exchange those moments of anxiety, hope, doubt, wonder, desperation and triumph for all dancing maidens, the Delmonico's fare and the stupid boats in all creation.”

“I see that not one of you knows what pleasure is,” said the last man in the group—a heavy-jawed, rather dull-faced fellow. “Did you ever fish—for game fish, I mean—trout, black bass, muskallonge, pickerel—I care not which? Ah, there's a sensation! You are beneath a blue sky, in a cooling breeze, with the green drapery of Nature gladdening every view. But you are uncertain whether you are to have any sport or not; just a little tired and discouraged—thinking of going back to your camp or trying somewhere else—when, zip!!!

what's that? You line pulls, your rod bends, you have got a dandy—a two-pounder, at least. Then follows one minute, or five minutes, of keenest, wildest, most magnetic, thrilling pleasure. What is it? Will you get it? Oh, thunder! It's off; but, no, no; there it is again. Give it a little line; reel in steady and slow. There! see that! a black bass—a big one—it leaped a foot from the water! Oh, my friends, take your dreamy waltzes, your ruddy wine, your demoralizing cards, your horses and your boats; but give me an hour at good fishing ground, and I'll ask no more."

FISHING, SAILING, DINING, DANCING, GAMES—AND PRETTY GIRLS!

At Mackinac every one of those dreamers would find satisfaction, and so would twice as many more of different tastes. The wondrous clear water, clearer than ever Lake George boasted, reveals the fish that you may catch; for you can see them gliding beneath you. It offers unparalleled boating pleasures, by oar and sail; the epicure will never fare better than there. There is bathing, too—a rare treat in the northern country; for in Lake Superior, for instance, I have heard that the water is so chilly that the sailors who work upon it do not learn to swim. There is dancing, there are many delightful pleasure routes for daily excursions, there is music, and, as to the girls—the Mackinac girls are as famous as the West is celebrated for the production of fine women. They come to this great resort in large numbers, from as far away as St. Paul, Chicago and Cincinnati—in lesser numbers from all parts of America. The young men who rove with fancies free, yet anxious to be fettered, tell me there is no such beauty-show in any of the other resorts, but I repeat the boast on their authority. I am not so wise as he whom Shakspere made to say: Between two girls who bath the merriest eye; I have, perhaps, some shallow spirit of judgement."

At Mackinac all the elements meet —the fashionable, the cultivated and the homespun beauties of the nation. So, when I tell you of the woodland walks, of the row-boats and the sailboats, of the bathing, and the tennis, and the dancing, and the picnics, and the excursions, and then declare the ladies to be matchless—if you want more, not all my travels will suffice for me to direct you where to go. The combination of scenic and human

loveliness recalls that “Day-dream on the Rhine” in the collection of poems edited by Longfellow: “. . . Where the laughing hills Thy majesty do greet, And echoes call from rock to rock All through the noonday heat. In earliest dusk the gathering stars Above thee love to meet. When lovers in the ferry-boat Forget the passing tide, And closer drawn, cling lip to lip, What though the river's wide. And silver clouds no secrets tell To the towers on either side.”

The highest praise, I think, that can be given to that or any place, I heard spoken with regard to Mackinac by a well-known New Yorker, who went there to spend a vacation such as he always had enjoyed, with varied sports and pleasures: “But I had overworked,” he said, “and was in that nervous conditions when I fancied no 61 place in the world would please me. And yet I not only had the best enjoyment of my life, but I got it from doing nothing. I simply drank in that marvelous tonic air, and loafed about in that wondrous placid scenery without a desire unsatisfied, only dreading the hour when I must pack up and leave it.”

It takes a brass bond to make some resorts popular. Mackinac needs nothing that Nature did not give it.

THE SQUAW WAY OF SHOPPING.

To a visitor from the East, the number of Indians seen, especially in Michigan, makes a deep impression. They are best seen and studied at Mackinac, where they have a little colony of their own, and where they perform a great deal of the work that is not wholly servile. They are the fishermen, boatmen, guides and gardeners of the region. It is very interesting to see their squaws at the village at Mackinac in the summer-tide. You will be apt to come upon three or four, with their blankets around them, seated in a store. You make your own purchases, go away and return in an hour, and there are those squaws just as you left them—still sitting there. That is how they shop; indeed, that is how the North American Indian, male and female, shops wherever you find him. They like to sit

down and contemplate the goods. If the proprietor tries to hurry them they will leave the place. When they get ready they buy, often by exchanging their goods for those of the white people. Very many beautiful varieties of Indian work in beads and bark are to be had at low prices in Mackinac, and many an Eastern and far Western and European home is decorated with these trophies of a summer at that place.

ARCH ROCK—MACKINAC. Am Bank Note Co. N.Y.

MACKINAC'S SCENIC BEAUTIES.

From many pens whose touch has been inspired by the beauty of this “Island of the Dancing Fairies,” I gather these descriptions of its charms: The natural scenery of the Island of Mackinac is unsurpassed. Nature seems to have exhausted herself in the clustered objects of interest which everywhere meet the eye. The lover of Nature may wander through th shaded glens, and climb over the rugged rocks of this island for weeks, and even months, and never grow weary; for each day some new object of beauty and interest will attract his attention.

As you approach the island it appears a perfect gem. A finer subject for an artist's pencil could not be found. In some places it rises almost perpendicularly from the very water's edge to the height of 150 feet, while in others the ascent is gradual. Parts of the island are covered with a small growth of hard-wood trees—beech, maple, iron-wood, birch, etc.—while other parts abound in a rich variety of evergreens, among which spruce, arbor-vitæ ground-pine, white-pine, balsam and juniper predominate.

Henry R. Schoolcraft, who first visited the island in 1820, wrote that “Nothing can exceed the beauty of this island. It is a mass of calcareous rock, rising from the bed of Lake Huron, and reaching and elevation of more than 300 feet above the water. The waters around are purity itself. Some of its cliffs shoot up perpendicularly, and tower in pinnacles, like ruined Gothic steeples. It is cavernous in some places; and in these caverns the

ancient Indians, like those of India, have placed their dead. Portions of the beach are level, and adapted to landing from boats and canoes. The harbor at its south end is a little gem; vessels anchor in it, and find good holding. The little, old-fashioned French town nestles around it in a very primitive style. The fort frowns above it, like another Alhambra, its white walls gleaming in the sun.

“The whole area of the island is one labyrinth of curious little glens and valleys. Old green fields appear, in some spots, which have been formerly cultivated by the Indians. In some of these there are circles of gathered-up stones, as if the Druids themselves had dwelt here. The soil, though rough, is fertile, being the comminuted materials of broken-down limestones.

“The island was formerly covered with a dense growth of rock maples, oaks, iron-wood, and other hard-wood species; and there are still parts of this ancient forest left, but all the southern limits of it exhibit a young growth. There are walks and winding paths among its little hills, and precipices of the most romantic character. And whenever the visitor get on eminences overlooking the lake, he is transported with sublime views of a most illimitable and magnificent water prospect. If the poetic muses are ever to have a new Parnassus in America, they should inevitably fix on Michilimackinac (the original name of the place when it was a trading post.— Ed.). Hygeia, too, should place her temple here; for it has one of the purest, driest, clearest and most healthful atmospheres.”

A sail around the island in one of the little steamers or yachts that are plentiful, presents a continuous succession of charming views, but none is more striking than that on entering the harbor at its southern end. The beautiful bay is crescent-shaped, and 64 its waters are so clear that a white marble or a silver quarter can be distinctly seen at a depth of from twenty to fifty feet. Myriads of fish are plainly visible as they cleave their way through the liquid crystal.

Library of Congress

Overlooking the bay, the tall white cliffs with their back-ground of waving forest; the fort, with its massive walls of whitewashed stone, clinging picturesquely to the brow of the precipice; the straggling little town at its feet, strongly recalling visions of Italian fishing villages; the long rambling hotels, with verandas above and below; the neat residences, with their grass plots and shrubbery, fountains and flowers, mingling among buildings that have been historic for three generations; and, as a frontispiece to it all, the wide, smooth, gently-sloping beach of snowy sand on which the

sunlit waters ever play, all combine to form a picture that, once seen, is never forgotten.

“The natural scenery of Mackinac is charming,” writes Constance Fenimore Woolson, whose admirable story of *Anne* is a local as well as a national classic. “The geologist finds mysteries in the masses of calcareous rock dipping at unexpected angles; the antiquarian feasts his eyes on the Druidical circles of ancient stones; the invalid sits on the cliff's edge, in the vivid sunshine, and breathes in the buoyant air with delight, or rides slowly over the old military roads, with the spicery of cedars and juniper alternating with the fresh forest odors of young maples and beaches. The haunted birches abound, and on the crags grow the weird larches, beckoning with their long fingers—the most human tree of all. Bluebells, on their hair-like stems, swing from the rocks, fading at a touch, and in the deep woods are the Indian pipes, but the ordinary wild flowers are not to be found. Over toward the British Landing stand the Gothic spires of the blue-green spruces, and now and then an Indian trail crosses the road, worn deep by the feet of the red men when the Fairy Island was their favorite and sacred resort.”

On the edge of a perpendicular precipice of white limestone, 155 feet high, just back of the town, is the fort which, in picturesque beauty of location, has no rival among all the fortresses of the United States. Its position somewhat resembles that of Fort Snelling, but is much more romantic.

Magnificent views of the surrounding lakes, channels, islands, promontories, forests, towns and shipping are to be had from every point on the lofty parapet; and the world affords no grander sight than a sunrise or sunset from the fort, the great globe of crimson and gold seeming at its rising to burst up from the bosom of Lake Huron and at its setting to plunge into the midst of Lake Michigan, casting a million prismatic tints of glorious light on wave and sky. It was of one of these gorgeous sunset scenes that Longfellow wrote: “Can it be the sun descending O'er the level plain of water? Or the Red Swan floating, flying, Wounded by the magic arrow, Staining all the waves with crimson— With the crimson of its life-blood; Filling all the air with splendor - With the splendor of its plumage?”

In such a spot, with the glories of earth and heaven unrolled before the gaze; where the atmosphere is as pure as the gales that wandered over primeval paradise; where the temperature is always cool enough to be bracing and invigorating; where a mosquito never was seen, nor malaria ever known; where the inducements 65 to constant exercise of every sense and sinew are as boundless as the beauties of the place, and where the healing fragrance of the pine, the hemlock and balsam fir are borne on every breeze, dyspepsia, languor and low spirits take flight, and as the poet might have said with more truth than most poetry, “hay fevers cease from troubling and the asthma is at rest.”

The querulous invalid, before he knows it, finds himself boating, fishing, strolling, flirting like a Harvard freshman. Well might Horace Mann, writing of the influence of “the wonderful isle” say, “I never breathed such an air before. I think this must be some that came clear out of Eden and did not get cursed;” suggesting the thought that however we lament “Paradise Lost,” we here behold the veritable “Paradise Regained.”

Am Bank Note Co. NY

SPECIAL FEATURES AT MACKINAC. FORTS MACKINAC AND HOMES.

Fort Mackinac, which stands on a rocky eminence above the town, was built by the English in 1780. The buildings are a hospital, outside that wall and east of the fort; a guard-house, near the south gate; officers' quarters on the hill near the flag-staff; quarters for the men in the centre; block-houses on the walls; magazine in the hollow, nor far from the south gate; store-houses, offices,

etc. There are persons yet living on the island who, during the troubles of 1814, took refuge in these selfsame block-houses. In the rear of the fort is the parade ground, and the spot where Captain Roberts planted his guns in 1812, while his whole force of Indians was concealed in the adjacent thickets. Capt. Roberts disembarked at British Landing, marched across the island, and took up his station at this point without being discovered.

Half or three-quarters of a mile behind Fort Mackinac, on the crowning point of the island, is Fort Holmes, built soon after the British captured the post in 1812. Each citizen was compelled to give three days' work toward its construction. The excavation encircling the earthworks was originally broader and deeper than now. The place of the gate is seen on the east side, one of the posts yet remaining to marked its position. In the centre of the fort was erected a huge block-house, beneath which was the magazine. Near the gate was the entrance to several underground cellars,. which have now caved in. The fort was defended by what we would now call "popguns," the largest of which was only an eighteen-pounder. History shows this fort to have been considered a very remarkable and formidable defense in its time. Its first name was Fort George, but when it became an American possession it was re-named in honor of Major Holmes, a hero who fell at Early's Farm.

ROBINSON'S FOLLY.

Robinson's Folly is just that and nothing more. As is so often the case where landmarks that acquire names existent long before they are written, the origin of the name is hopelessly hazy. One legend has it that "Captain Robinson, a great admirer of the ladies, while strolling in 67 the woods suddenly beheld a few rods before him a beautiful girl, who

retreated as fast as he approached, until finally she stood almost on thee edge of the cliff and in his eagerness to capture, as well as to save her from that death which would have been preferable to his intentions, the captain sprang forward to seize her, but just as he clutched her arm, she threw herself forward into the chasm, dragging her tormentor and would-be saviour with her. His body alone was found. He was long mourned by his men and brother officers, until by and by it began to be whispered that the captain had indulged too freely in the fine old French brandy that the fur traders brought up from Montreal, and the lady was a mere *ignis fatuus* of his excited imagination, but the mantle of sentiment has been thrown over the tragedy, and a romantic explanation given in its place."

Another legend is that after the removal of the fort to the island in 1780, Captain Robinson, then in command, had a summer house built upon the cliff, which soon became a frequent resort for himself and brother officers who, with pipes, cigars and wine, whiled many an hour pleasantly away. After a few years, by the action of the elements, a portion of the cliff, together with the house, fell to the base of the rock, which disastrous event gave rise to the name. The brow of this cliff is 127 feet high.

FAIRY ARCH.

Fairy Arch, a little to the north of this, stands out boldly near the base of an immense rock, and is well worth a visit. Words cannot fully describe the novelty and beauty of this eccentricity of Nature or the sensations it produces. It is a magnificent natural arch, spanning a chasm of eighty or ninety feet in height, and forty or fifty in width. Its summit is 149 feet above the level of the lake. Its abutments are composed of calcareous rock, and the opening underneath the arch has been produced by the falling down of the great masses of rock now to be seen upon the beach below. A path to the right leads to the brink of the arch, whence the visitor, if sufficiently reckless, may pass to its summit, which is about three feet in width. Here we see twigs of cedar growing out of what appears to be solid rock, while in the rear and on either hand the lofty eminence is clothed with trees and shrubbery—maple, birch, poplar, cedar and balsam. Before us are the majestic waters of

Lake Huron, dotted in the distance with islands. We may now descend through the great chasm, “arched by the hand of God, “ and at the base of the projecting angle of the main rock find a second arch less magnificent, but no less curious and wonderful. From the beach below the view is very grand and imposing.

It is held that the portion supporting the arch on the north side, and the curve of the arch itself, are comparatively fragile, and cannot for a long period resist the action of rains and frosts, which, in this latitude, and on rock thus constituted, produce great ravages every season. The arch, which on one side now connects this abutment with the main cliff, will soon be destroyed, as well as the abutment itself, and the whole be precipitated into the lake.

SUGAR LOAF ROCK.

The plateau upon which Sugar Loaf Rock stands is 150 feet high, while the summit of the rock is 284 feet above the lake. Its composition is the same as that of Arch Rock. Its shape is conical, and from its crevices grow a few vines and cedars. It is cavernous, and in the north side is an opening sufficient to admit several persons. The view from the top is exquisite. Half a mile to the rear of the fort, and only a short distance to the right of the road leading to Early's Farm, is

SKULL ROCK, noted as the place in which Alexander Henry was secreted by the Chippewa chief, Wawatan, after the massacre of the British garrison at Old Mackinaw. Near the house now occupied by Mr. Early is that relic of 1812, the old Dousman house, across the road from which is the battle-ground. A short distance down the road leading through this farm is BRITISH LANDING, where Captain Roberts disembarked a force of English, French and Indians to take the island in 1812. The Americans, under Col. Croghan, also landed at this same place in August, 1814, under cover of the guns of the squadron, and marched to the edge of the clearing, now Early's Farm. But the enemy

were in waiting, and hardly had he reached the scene when a fire was opened upon him, and the woods on every side literally swarmed with savages. He was obliged to retreat, with the loss of Major Holmes and several men. To the right of British Landing is the road through the woods to SCOTT'S CAVE, which is under one of the huge rocks peculiar to Mackinac. Its entrance is very low, but in the interior a giant might stand erect. Unless provided with a candle or lantern, the visitor will find himself in almost total darkness.

THE DEVIL'S KITCHEN.

Leaving the town at its western extremity, and following the foot-path around the brow of the high bluffs which bound the southwestern side of the island, for about a mile, then, descending a zig-zag stair, you come to the Devil's Kitchen, a cavernous rock, curious in its formation as well as its name. Near it is a spring of clear, cold water. The road along the beach should be avoided as it is utterly impracticable. A few yards further on is the famous LOVER'S LEAP.

The Lover's Leap, about a mile west of the village, is a high, perpendicular bluff, rising sheer from the lake nearly 200 feet. The legend that gives the giant cliff its name is of a young Ojibway girl and her warrior love. You who have not seen the noble red man and his squaw will perhaps find a great deal more poetry and charm in the legend than those of us who have made the acquaintance of the various tribes from Hudson Bay to the Apache country. The Ojibway girl's name was Me-chene-mock-e-nung-o-qua, and you will please remember that it was with no hope of ever changing it that she fell in love with Ge-niw-e-gwon, the valiant brave, for marriage does not offer that boon to the Indian girl. At all events, she often wandered to this cliff and gazed from its dizzy heights, and witnessed the receding canoes of the large war parties of the combined bands of the Ojibway and Ottawas speeding south, seeking fame and scalps.

And it is recorded that she sang the Ojibway love-song, running like this: “A loon, I thought, was looming, A loon, I thought, was looming, Why! it is he, my lover! Why! it is he, my lover! His paddle in the waters gleaming, His paddle in the waters gleaming.”

Those Indian songs are pretty only when you can't hear them, by the way, and it happened that when she sang the brave she loved was far enough away to feel no disturbance from the music. The tale goes on to say that she could distinguish his cries amid the shouts of the returning warriors; but one day she missed his voice, for an enemy's arrow had pierced his heart, and after his body had been placed against a tree, facing his enemies, the rest of the tribe left him and came home. The heart of the girl with the long name hushed its beatings, and all its warm emotions were chilled and dead. The spirit of her beloved warrior she witnessed 69 continually beckoning her to follow him to the happy hunting grounds. He appeared to her in human shape, but was invisible to others of his tribe.

One morning her body was found mangled at the foot of the bluff. The soul had thrown aside its covering of earth and gone to join the spirit of her beloved brave; and there to-day, forgetful of the dear, dirty girl with the broadgauge name, the young people of to-day land in boats and picnic while modern braves in blazers sing, as Dibdin did of old: “'T was post meridian half past four, By signal I from Nancy parted.”

The fascinating yet unwholesome shadow of legendary sadness melts in the glamour of nineteenth century *dolce far niente.*

CHIMNEY ROCK is a very remarkable freak of Nature. A foot-path which leads from the beach near the base of Lover's Leap to the plateau above brings you to the Davenport farm, now owned by the Mackinac Island Summer Resort Association, where a miniature village of elegant summer cottages has been built, to which additions are made each season. A central building is used as a dining hall, from which meals are furnished at very near cost. Eighty acres have been neatly laid out and platted, and lots for the erection of

cottages can be purchased on very advantageous terms. Improvements already aggregate many thousands of dollars.

A CRADLE OF HISTORY.

The history that we venerate as patriots is juvenile compared with the chronicles and legends that distinguish Mackinac and its neighborhood. When all Southern Michigan yet lacked its Marquette or its Stanley, Mackinac was a missionary seat, a trader's post and a garrisoned stronghold. From Mackinac colonization spread throughout the surrounding territory, Wisconsin and even Minnesota being settled by men who started from this citadel of progress. Cadillac, founder of Detroit (in 1701), had long commanded at Mackinac. Men alive to-day recall when Chicago drew her supplies from this place. This was by no chance or trick of destiny. Mackinac is a historical centre because it is a geographical centre. Nature alone gave it its advantages, and made it what it has been in history.

The flags of three great nations have successively floated over the post at Michilimackinac, which has been the theatre of many a bloody tragedy. Its possession has been disputed by powerful nations, and its internal peace has continually been made the sport of Indian treachery and Caucasian duplicity. One day chanting *Te Deums* beneath the ample folds of the *fleur-de-lis,* next yielding to the power of the British Lion, now it rests peacefully as the stars and stripes float over its verdant battlements. Its historical associations render it classic ground, and the many wild traditions peopling each rock and glen with spectral habitants combine to throw around Mackinac an interest and sentimental attractiveness such a few, if any, other places on the Western Continent possess.

As far back as history begins to blend with traditions that reach into the dimmest past, Mackinac Island has been a place of great interest. A legend relates that a large number of Indians were once assembled at Point St. Ignace, now the eastern terminus of the Duluth, South Shore and Atlantic Railway, and while intently gazing at the rising sun, during the great Manitou, or February Moon, they beheld the island suddenly rise up from

the water, assuming its present form. From the point of observation it bore the fancied resemblance to the back of a huge turtle; hence they called it by the name of Mosche-ne-mac-e-nung, which means a great turtle. This name, when put into a French dress, became Michilimackinac, to be in turn again abbreviated by the always practical English into Mackinac and Mackinaw.

According to Indian tradition, the island is the birthplace of Menabosho, the god of water—the Hiawatha of the Algonquin Indians. Indian mythology makes it the home of the Giant Fairies, and the red men, in passing its shore, made offerings of tobacco and other articles to these spirits. These fairies, we are told, had a subterranean abode under the island, the entrance to which was near the base of the hill, just below the present southern gate of the fort. An old Indian, who once revisited the limits of the present garrison, was believed by his kinsmen to have had exceptional opportunity to prove the truth of this tradition. These were the circumstances: During the night, while he was wrapped in slumber, one of the spirits laid his shadowy hand upon him and beckoned him to follow. In obedience to the mysterious request, the Indian's soul parted from his body and went with the fairy. Together they entered 71 the mystic dwelling place of the spirits, and the Indian was introduced to the great spirits assembled in solemn conclave. He was lost in wonder and admiration at what he saw around him, and he described the place where they were assembled as a very large and beautiful wigwam. Beyond that, he simply asserted that, after a time, the master spirit of the assembly directed one of the lesser spirits to conduct him back to his body. The story is chiefly interesting to me as showing that it was as easy to concoct a spiritualistic story then as it is to-day—and just as easy to make some folks believe it afterwards!

The “Ancient Miners” of Upper Michigan, presumably connected with the “Mound-builders” of the Mississippi Valley, and with the Toltecs and Aztecs of Old Mexico, may have had an agricultural outpost at St. Ignace or Mackinac Island. The vestiges of a mound have

been traced in the neighborhood of Point La Barbe. No tradition, however, referring to that people, is found among our Indians.

In 1671, Father Marquette, pioneer and priest, wrote that “Michilimackinac is the key, and as it were, the gate for all the tribes from the south, as the Sault is for those of the north, there being in this section of country only those two passages by water; for a great number of nations have to go by one or other of these channels, in order to reach the French settlements. This presents a peculiarly favorable opportunity both for instructing those who pass here, and also for obtaining easy access and conveyance to their places of abode.”

Father Marquette was doubtless the first white man to visit it, or at least, to dwell upon it. He established a school on the island in 1671, for the education of the Indian youths, and so much was he attached to “the Straits” that, when he died in 1675, it was at his request his Indian converts brought his body back to the little mission established by him at St. Ignace.

The first vessel ever seen on these waters was the “Griffin,” built by the explorer, La Salle, on Lake Erie, in 1678.

In 1695, Cadillac, who still later founded Detroit, established a small fort here. Then came contests and skirmishes, not unmingled with massacres, until finally Mackinac, with all the other French strongholds on the lakes, was surrendered to the English in September, 1761. In 1763 began the conspiracy of Pontiac—a *coup de guerre* wonderful for the sagacity with which it was planned and the vigor with which it was executed. Pontiac was the most remarkable Indian of all the lake tribes. He was a firm friend of the French, and to aid their cause, arranged a simultaneous attack upon all the English forts in the lake country and in a vast region south of it. Eleven posts were assaulted and eight were captured.

Fort Michilimackinac was among the latter. Three officers and thirty-five men defended it. A band of Chippewas, while playing a game of ball just outside of the fort, knocked the

ball, as if by accident, so that it fell inside the stockade; the players rushed after it, and seizing their weapons from squaws, who had them concealed under their blankets, and had previously entered the fort as a part of the plot, they raised the war-whoop and fell upon the garrison. A lieutenant and fifteen men were killed and a captain and the rest of the garrison were taken prisoners, to be ransomed afterwards.

A year afterwards, a treaty of peace having been made with the Indians, troops were again sent to raise the English flag over the fort. By a treaty of peace between Great Britain and the United States September 3, 1783, the island fell within the boundary of the United States, but under various pretences the English refused to withdraw their troops. By a second treaty concluded November 19, 1794, it was stipulated that the British should withdraw on or before June 1, 1797. Two companies of U.S. troops arrived in 72 October, 1796, and possession, a previous treaty with the Indians having secured from them the post. During the war of 1812 the island was again surrendered to the British. After the victory of Commodore Perry on Lake Erie in 1813, an effort was made to recapture it, but the troops sent were insufficient in numbers, and not until 1814 was the American flag again hoisted over the Gibraltar of the lakes.

In savage minds Mackinac's superb position was appreciated, then the missionaries made it their chief pulpit, next civilized warfare made it a coveted stronghold, later it became a commercial centre. I now refer to its connection with the fur trade carried on by John Jacob Astor, Esq., of New York. Mr. Astor organized the American Fur Company, with a capital of two million dollars. It had no chartered right to a monopoly of the Indian trade, yet by its wealth and influence it long controlled that trade. The outposts of the company were scattered throughout the whole west and northwest. This island was the great central mart to which the goods were brought from New York by way of the lakes, and from Quebec and Montreal by way of the Ottawa, Lake Nipissing and French River. From this point they were distributed to all the outposts; while from all the Indian countries the furs were annually brought down to the island by the company's agents, whence they were sent to

New York, Quebec or to Europe. This company was organized in 1809 and continued to do business until 1848.

THE WATER ROUTE TO MACKINAC.

Beauteous Isle! I sing of thee, Mackinac, my Mackinac; Thy lake-bound shores I love to see; Mackinac, my Mackinac. From Arch Rock's height and shelving steep To western cliffs and Lover's Leap Where memories of the lost one sleep, Mackinac, my Mackinac. Thy shore once trod by British foe, Mackinac, my Mackinac That day saw gallant Holmes laid low Mackinac, my Mackinac Now Freedom's flag above thee waves, And guards the rest of fallen braves— Their requiem sung by Huron's waves Mackinac my Mackinac. — *From lines by a Mackinac poet.*

Perhaps the pleasanter route to Mackinac—certainly so to those who love to be on the water—is by boat from Munising Bay over a third of the great lake, past the Pictured Rocks and down the St. Mary's River. Munising is readily reached from any point on the famous “Short Line”— the Duluth, South Shore and Atlantic Railway. You leave Old Munising at about noon and are soon in the enchanter region of the Pictured Rocks. The sand hills that succeed the beautiful rocks are of variegated hues, also. They are treeless and extend far back, terrace upon terrace. It is a beautiful Sahara, without its heat, that you seem to be looking upon. But the view is quickly lost, and you come upon a little archipelago of verdant islands laving their bases in the pellucid and chromatic waters of the giant lake. Every mile and moment is passed amid cool, softly winging breezes that catch and carry the refreshing temperature of the great mass of water.

Forward, onward, the proud steamer cleaves her way through the crystal sea until at Grand Merais there is a pause and glimpse at the costly work the federal government is prosecuting for the creation of a harbor of refuge. There are other reminders of the cruel fury of this veritable inland ocean during the stormy winter season. At periodic intervals

stations of the life-saving are seen, precisely as on the New England or New Jersey coast. Like the ocean coast stations, they are thoroughly equipped and bravely manned.

But the keener pleasure of the journey is beyond Sault Ste. Maria—the journey down the St. Mary's River. The St. Mary's is a noble and board river, but the channel is narrow, crooked and beset with dangers to all but the most skillful pilots. Rocks that are visible and rocks that are hidden are both so numerous that no vessels make the run after dark. After the exciting part of the voyage is ended the river broadens into almost 73 lake-like width, and innumerable beautiful islands deck its surface. The river ends in Potoganissing Bay and that, in turn, leads into the body of which it is a part—Lake Huron. The course of the boat has been southeasterly up to this point, but in Lake Huron it is abruptly changed to an almost westerly course, and presently beauteous Mackinac towers in view. In the following verses the expectant tourist may discover how this journey affected a poet who experienced it: ST. MARY'S RIVER. By John M. Talman. The workmanship of Nature's hand No rarer gem that this has shown; The glamor soft of fairyland Upon this luring realm is thrown. On boulder vast and current swift The first gleams of the morning quiver, While in a dreamy calm I drift Adown St. Mary's shining river. In power, in stateliness and pride, Majestic ships the waters brave, As on and ever on they glide To crown with sail the Huron's wave. The matin glow, the noontide blaze, The fiercely swirling eddies shiver; The peace of old Arcadian days Surrounds St. Mary's beauteous river. The devious lines of tree-clad shore To shapes of wondrous grace are bent, And flashing waters onward pour, With thickly verdured isles besprent. Sweet messages of amity Shore, isle and stream to lake deliver; A houseless Venice seems to be Upon St. Mary's mighty river.

And so this work is ended. It is only necessary to say, in advance of a last farewell, that the author has been obliged to discuss and explain some especial subjects in knowledge of which he was so much at a loss that he must needs borrow from the writings or the verbal assistance of others. In all such cases he has frankly given what credit was due—quite selfishly, if you please, for no wise man, however scanty his morals, would care to make himself responsible for a single statement for the truth of which he could not vouch.

But to Mr. John M. Talman, of the St. Paul *Pioneer-Press,* added and especial credit and thanks are due. He is familiar with the region here described, has seen it with his own uncommonly observant eyes, and has written bits and paragraphs here and there in this work with a pen that is quite as felicitous in descriptive work as every reader of this book has discovered it to be in the word-melodies of poesy.

Shall that older poet, Prior, see me out of your presence with this ancient impudence of his: “As long as we have eyes or hands or breath We'll look or write or talk you all to death?”

No; rather let me write what Robert Burns would have written had he been born somewhere along “The Short Line” instead of in Scotland:

Farewell to the mountains high covered with snow; Farewell to the straths and green valleys below; Farewell to the forests and wild-hanging woods; Farewell to the torrents and land-pouring floods. My heart's in the Bowstring, my heart is not here, My heart's in the Bowstring, a-chasing the deer, Chasing the wild deer and following the roe; My heart's in the Bowstring whenever I go.

Am B. N. Co. NY

A SKETCH OF THE GEOLOGY OF THE MARQUETTE AND KEWEENAWAN DISTRICTS. BY Dr. M. arshman E. dward WADSWORTH, Director of the Michigan Mining School and State Geologist of Michigan. 2d Edition.

GEOLOGICAL.

AZOIC SYSTEM.

The region about the south shore of Lake Superior is to geologists one of the most interesting districts of the United States, embracing as it does, in a limited area, old crystalline rocks, together with forms that are almost in their original condition of a beach

sand and mud. In this region was first established the base of the geological column, the Azoic (without life) System of Foster and Whitney, or the Archæan (the beginning) of Dana. Overlying this system are found the sandstones and limestones of the Palæozoic (ancient life), with their interbedded lava flows.

These systems possess a strong economic interest, owing to the stores of iron in the Azoic and of copper in the Palæozoic of this district, which forms one of the most important mining regions in America.

The geology of this section is so difficult and complicated that, in its general discussion, perhaps no proposition can be stated concerning any portion of it, to which exceptions cannot be taken. Indeed, out of the general discussion of different points comes in time the truth, and various geologists, even now, are working over this region in the endeavor to arrive at some consensus, or at least to determine, upon what points they can agree, and upon what points difference of opinion will have to exist between them at present until further evidence can be obtained. The writer will endeavor to give in a brief form that which appears to him at present to be the most correct statement of the geological structure of the region, admitting that from time to time, as more complete evidence shall be obtained, he expects to change his views in the future as has been done in the past, if that evidence shall cause him to believe that he has been mistaken.

The Azoic or Archæan System south of Lake Superior consists of rocks that have been formed in three ways: 1st, by mechanical means; 2d, by eruptive, igneous, or volcanic agencies; 3d, by chemical (including electro-chemical) action.

FRAGMENTAL OR DETRITAL ROCKS.

The mechanical agencies of the Azoic time acted upon some prior-formed rocks, in like manner as we see rain, winds, waves, frosts, etc., now breaking down the rocks of the present day, causing them to be deposited as soil, mud, sand and shingle, forming detrital or sedimentary deposits. Such detritus one can see upon the shores of any lake or sea,

being in many localities variable in its composition, and oftentimes abruptly changing from fine mud to sand or even to coarse shingle. At other localities upon the same lake shore one may observe a nearly uniform sand, mud, or shingle stretching away as far as the eye can reach along that shore. Like uniformity and like abrupt changes are seen by the geologist to occur in the rocks formed from the ancient muds, sands and shingle of the early seas and lakes. These deposits may have remained on the surface of the ancient beach, or may have been deeply buried under succeeding deposits; but whatever may have been their position relative to the earth's surface, they have been greatly changed or altered from their original condition, although the evidences of that original condition remain plainly visible to him who has learned to read the worn, torn, and worm-eaten book of Nature. In truth it may be said that no act can take place without 78 leaving its effects behind, and these can be interpreted with greater or less clearness, until their record has been entirely obliterated.

To return. We find that these old muds, sands and shingle have been acted upon, and metamorphosed or altered, by heat from the earth's molten interior, or from contact with igneous or volcanic rocks, with their accompanying hot waters. Or, again, these deposits have been affected by hot or cold waters percolating through them, bearing materials which chemically act upon them; or, again, they may have been subjected to greater or less squeezing and pressure during the formation of the numerous wrinkles that old Mother Earth now wears upon her rugged face, deeply furrowed with her tears.

Of all the agents of consolidation and change in rocks, the chemically active waters are, to my mind, the most potent; and it appears to me probable that dry heat and pressure alone would be unable to produce any general and widespread rock alteration, if it were not for the intervention of the percolating waters found in all rocks, so far as man has been able to penetrate the earth. Such metamorphosed or altered detritus forms the oldest known rocks of the Lake Superior district, and we know of the original rocks only by the remains of that debris now found in them. From the character of that debris it appears that the original

rocks were of igneous or volcanic origin; that is, they made up the early formed crust of the earth or else were produced by the earth's primitive volcanic activity.

When the muds, sands or shingle have been consolidated they are found to form rocks that differ, not only in the fineness of the material in them, and in their chemical and mineral composition, but they vary also according as they have been subjected to different agencies and conditions.

Thus it is that the muds have formed the rocks known as the argillites, shales, most schists, and some gneisses; the sands have formed sandstones, quartzites, some schists, and most gneisses; while the shingle generally finds its expression in the conglomerates.

The term argillite is used to indicate those consolidated muds that were largely composed of clay or argillaceous material; but the argillites are commonly known as slates—a term properly applied to an argillite only when it has been subjected to pressure and chemical action to such an extent that it has the property of splitting indefinitely into thin plates, that have no relation to the original structural or sedimentary planes of the rock. This property of being cleaved or split is known as cleavage, and it is by no means confined to that variety of argillite known as slate. When argillites contain considerable carbon, either unchanged or in the graphitic form, they are known as carbonaceous or graphitic argillites. In the Azoic district of Northern Michigan argillite is abundant, the common forms being found along the lake shore and inland south of Marquette, in the vicinity of the Hotel Marquette. It also occurs at Ishpeming and Negaunee, in the vicinity of the mines, forming, with the chlorite schist, their principal country rock. Argillite is also found extending from the vicinity of L'Anse Bay to Huron Bay and the Huron Mountains, forming in some portion of its extent an excellent slate, which is worked in the vicinity of Arvon. The L'Anse argillite passes not only into the slate variety, but also into the carbonaceous or graphitic variety. It is this variety of argillite, forming the country rock of Sec. 33, T. 50 N., R. 33 W., that has been quarried or mined under the name of “Baraga graphite,” the carbonaceous material

forming a constituent portion of the country rock, and not a vein, as has been reported. A similar argillite is also found on the southern side of Teal Lake.

When the quartz sands that form a sandstone have been greatly altered or indurated, so that the rock is composed of a very hard, compact mass of quartz grains, it forms a variety 79 of sandstone known as quartzite, a very common rock in the vicinity of Marquette and Negaunee, and much quarried for ganister. Some of the well-known localities are near the Marquette State Prison, Mt. Mesnard, and northeast and northwest of Teal Lake, in its immediate vicinity. It is also abundant about the Jackson, Cleveland, New York, Republic, and Champion iron mines.

The terms schist and gneiss are used to designate all those altered or metamorphosed detrital deposits, whose minerals are arranged in more or less parallel bands, along which the minerals tend to lie flatwise or lengthwise, causing the rock to split into more or less regular plates parallel to these bands. These bands (or foliation of the rock) may or may not be coincident with the original planes or lines along which the detritus was deposited (planes of sedimentation), and in the majority of cases in the Marquette region they do not coincide. A striking example of this can be seen in the schist north of Teal Lake, where the planes of deposition run approximately northeast and southwest, while the foliation runs east and west.

The varieties of schist are named according to some one or more of the prominent minerals in them, as hornblende schist, mica schist, quartz schist, chlorite schist, actinolite schist, etc., for the schists that contain the minerals hornblende, mica, quartz, chlorite, actinolite, etc.

The altered muds, sands or shingles may be found continuous over large areas, or they may be found, like their modern representatives, to pass gradually or abruptly into one another. Thus it is that quartzite is found to pass into quartz, mica and chlorite schists; the chlorite schist into argillite, conglomerate and hornblende schists, etc. Hornblende schists

are well developed about Marquette, forming much of the rock underlying the northern portion of the city, especially about Light House Point an the region adjacent. Chlorite schist occurs commonly with argillite in the vicinity of Marquette an about the iron mines of Negaunee, Ishpeming, Champion and Michigamme, forming even more of the country rock than the argillite does, which is sometimes wanting.

Grunerite schist and mica schist occur in the vicinity of Republic, Humboldt and Champion, while ottrelite schist is found in the vicinity of the two last named mines. Conglomerates are found in the vicinity of most of the iron mines, also by the Republic branch railroad near Humboldt, as well as in the vicinity of Deer and Silver Lakes.

ERUPTIVE, VOLCANIC OR IGNEOUS ROCKS.

To obtain a fair idea of rocks of this character it is necessary to do as we have done with the detrital or fragmental rocks; that is, to observe carefully the recent forms and trace out their structure and various modifications and alterations. If this is done, we see that the eruptive rocks are changed or metamorphosed as much as, and oftentimes more than, the sedimentary formations.

It may be illustrated by allowing some of the molten iron from our furnaces to run at waste over the ground and into the crevices, so as to be left exposed to the air, frost, wind and snow. It would first solidify, then crack or form joints, as all rocks do, and, owing to the action of the air and rain, it would decompose and alter, until finally it would form an earthly iron ore totally unlike the original iron. Why is this? The answer is that the iron, when it passes from its furnace, is exposed in the outside atmosphere to conditions entirely unlike those in the furnace, and it must change its state to conform with those changed conditions. So, too, the eruptive rocks, coming in a liquid state from the interior of the earth's furnace, cannot endure unchanged the conditions which exist at or near the earth's surface. They are in an unstable condition, and must be made over into a more stable 80 mineral composition. The agencies that produce that change appear in general to be

the same as those which alter the sedimentary formations, that is, percolating waters chemically active, pressure, and heat of cold. The first stage is the change from a liquid or pasty mass into a solid one; later there comes a more or less variable alteration that extends throughout the entire mass, and causes variation in the mineral composition and structure—so much so that at times no traces of its original condition remain, unless they be its form or its relative position to other rocks.

It is these changes that cause rocks that were originally peridotites or olivine rocks to be now called serpentines, actinolite schists, talc schists, dolomites and verde antiques; or cause formerly molten basalts to be now called melaphyrs, diabases, gabbros, diorites, eclogites, amphibolites, hornblende schists, chlorite schists, mica schists, amygdaloids, traps, greenstones, variolites, granites, etc. It may here be said that schists very commonly result from the alteration of eruptive rocks, and are produced, as well, by the change of sedimentary ones. It is alteration that causes rocks that were formerly andesites now to form rocks that are called phonolites, propylite, hornblende porphyry, porphyrites, diabase, melaphyr, diorite, granite, schist, etc. In the same way what were once trachytes now form felsites, phonolites, porphyries, granites, gneisses etc.; while the rhyolites, in their alteration, form rocks called felsites, petrosilex, gneisses, granites, quartz porphyries, etc. It will be inferred from the above that the alteration of eruptive rocks produces, from forms that were originally distinct, forms that are now known by the same name; while, on the other hand, the varieties due to the various changes of a single rock species are very numerous.

The structure of eruptive rocks differs very much according to their composition, and according to the conditions under which they have cooled, whether slowly or rapidly, as well as according to the conditions to which they have since been subjected. That is, a mass slowly cooling will be found to contain much larger mineral forms, known as crystals, than a mass suddenly chilled.

The eruptive rocks, in their relations to their associated country rocks, will also vary according to the conditions in which they have reached their present position relative to the latter.

If the liquid material (lava) forces its way through a rock, filling the cracks that then existed in it, like putty filling a crack in glass, the solidified lava is known as a dike. It is to be observed, however, that when rocks are but little consolidated, the eruptive or liquid material tends to force itself along the planes of deposition of the sediments, or parallel with the foliation, or else to break irregularly through whatever portion of the rocks offers the least resistance. But when the rocks have become solid then the flow more commonly takes place along cracks or fissures in the rocks which extend across the country, like the cracks made in a thin sheet of ice. Usually these dikes may be distinguished by their being closely welded on each side to the country rock, which is often indurated or hardened at the point of contact; by their being compact and fine gained at the junction with the country rock, thus showing a rapid cooling, due to their coming in contact with the cold sides of the fissure; also by their being more coarsely crystalline or coarse grained toward the centre than at the margin, because of the greater length of time the interior mass would be in cooling; oftentimes, by the dikes holding, on both sides, the fragments of the country rock caught up in the passage of the lava. The difference between the sides and interior of dikes is usually less marked in those rocks which contain over sixty-five or seventy per cent. of silica, than it is in rocks containing a less amount. Oftentimes the lava welling up through a fissure will fail to reach the surface, and usually hardens in a wedge or knob-like form; but at other times it flows 81 out over the surface of the earth, in like manner as water passing through a fissure will flow over the surface of ice. When lava flows out from long fissures and floods the country, such flows are commonly known as fissure or massive eruptions, especially if the flows were attended with little or no explosive action. If the lava passed through a hole or channel like a “blow hole” in ice, and especially if attended with explosive action, it is commonly called volcanic. The massive fissure or quiet eruptions were more common in the earlier days of this earth, the explosive or volcanic

eruptions have been more common in later geological time, or recent times. Since all these are manifestations of the same general cause, we shall use the term volcanic to include all eruptive phenomena.

Lava flows may generally be distinguished from dikes or intrusive masses of lava by the underside of the flow being welded to the country rock, by its having baked or indurated the underlying rock, and by its holding fragments of it; also by its conformity to the original surface of that underlying country rock. The flow is usually fine grained or compact at its base owing to rapid cooling, but a short distance from its base it becomes of a coarser texture, and usually shows the coarsest structure below the centre of the flow, at a point which was the longest in cooling. The upper surface of the flow is commonly wrinkled, cellular and slaggy, if it has not been worn off. The overlying country rock is laid down upon this surface, it conforms to the inequalities of the underlying lava, and generally contains fragments derived from it. The overlying sedimentary rock is not welded to the underlying lava, nor does one affect the other in any way, unless it be by chemical action.

When any explosive action has taken place, ashes and larger fragments of the disrupted lava are strewn about, which may or may not be subsequently worked over by wind and water. Lava, as soon as it is exposed to the waves, is worn away, like any other rock, and we may find its worn detritus deposited by its side, ere the main mass has been cooled.

THE OLDEST SEDIMENTARY AND ERUPTIVE ROCKS.

The location in which these rocks have been best made out by the State Geological Survey, is in the Cascade Range in the vicinity of the Volunteer mine. Here one finds an old hornblendic schist that has been invaded by eruptive granite and other volcanic rocks. This formation is especially marked to the southeast of the mine, and rises in abrupt but low hills near the stream. It is not impossible that the hornblendic schist may be a changed eruptive or volcanic rock instead of being a sedimentary one, although the evidence thus far obtained points to the latter origin.

Towards the mine one finds a sedimentary rock lying on the oldest schist and granite, and composed of their debris. This is especially marked in the vicinity of the stream. Some of the boulders that make up this detrital deposit are several feet in diameter, while the rock passes from a coarse conglomerate into a fine schist apparently composed of granitic mud. The formations that overlie this will be spoken of elsewhere.

JASPILITES AND THEIR ASSOCIATED IRON ORES.

Associated with early detrital rocks are the immense bodies of iron ore and jaspilite in the Marquette district. The relations of the ore and jaspilite to each other and to their associated schists and quartzites are matters of very great economic and scientific importance, to which, therefore, much attention has been paid. Most of the opinions advanced have been based on preconceived notions, rather than upon a thorough study of the rocks in place and conclusions drawn from the evidence they present. This method, which the writer deems the only correct one, and which has been 82 followed by some geologists, has thus far led to very different conclusions amongst them. This difference of opinion arises from various causes, some of the chief of which are that the observers see different facts, as well as draw different conclusions from the same facts. Some of the different views will be given below, commencing with the view that the jaspilites are of eruptive origin.

If we return to the partially, or not at all, consolidated detrital rocks that existed as sea deposits in the primitive days, we find that these rocks were apparently invaded by eruptive material which forced its way irregularly through the soft sedimentary materials, indurated them, bent their planes of deposition, changed their color, and sent tongues, arms and dikes through them in every direction. It has also been protruded through the schists in large masses, contorting them and tearing them across, and oftentimes ending in small arms and branches. This eruptive rock is now very greatly metamorphosed, and is termed jaspilite. Like the siliceous eruptive rhyolites and felsites, it is generally more or less banded in its character, which banding is due apparently to its having flowed, a

phenomenon that has its counterpart in the banding of the siliceous furnace slags, such as one may see about the iron furnaces of the Marquette district. It is this fluidal structure or banding that is so often mistaken in the rhyolites, felsites and trachytes for the planes of sedimentation.

It is a well known fact that all of the eruptive rocks contain iron in the form of magnetite and hematite in greater or less abundance, and some contain iron in its metallic state. The latter is the case with some basaltic dikes in Greenland, which hold not only finely divided magnetite and metallic iron throughout their entire mass, but also contain immense blocks of metallic iron imbedded in them. So, too, the old, coarsely crystalline, eruptive basalts known as gabbros contain, about Duluth and elsewhere in Minnesota, so much iron ore that they have been worked for it, and the only drawback to their successful working is the fact that the iron contains titanium. Were iron ore as valuable as native copper, there is not a dike or lava flow of any size that it would not pay to work; and were iron ore as valuable as silver, no eruptive rock now exists on the face of the globe that would not be actively prospected. The question is merely one of value and amount. In the same way we find iron ore associated with the jaspilites to a greater or less extent. In some places the ore is locally concentrated with little or no jaspilite; in others the jaspilite predominates, and forms a lean ore not suitable for working. The concentration of

Open pit Mining

the ore, in bodies sufficiently rich to be worked, is very irregular, but the ore is said to be generally in lenses connected by the intervening leaner portions of jaspilite, the amount of the workable portion varying, of course, with the varying price of ore.

The jaspilite, with its associated ore, is found to have been subsequently broken or jointed, and the cracks filled in with iron ore, apparently through the action of the percolating waters, which have acted chemically on both the jaspilite and its ore, and brought about great changes in both. Further, we find that the jaspilite and its ore have been broken up and worn away by the ancient waters, and deposited as mud, 83 sand and shingle

upon the underlying ore deposits. This detrital or sedimentary material has become consolidated, and forms true sedimentary deposits of iron ore, which in many places are apt to be lean. These deposits have been worked, to a greater or less extent, for their ore.

Wherever the intrusive masses of the jaspilite have come in contact with the schists the latter have been impregnated with iron to a greater or less extent, and these impregnations are sometimes mined.

The iron ore that belongs with the jaspilite is mainly of two mineral species, magnetite and hematite. The former is known by its forming a black powder when pulverized, and by its fragments being attracted by a magnetized knife-blade. It crystallizes in eight or twelve-sided figures (octahedrons and dodecahedrons), but usually the crystals interfere with one another, so that none of them can attain a complete form; hence there results a granular grains composed of irregular, rounded grains like pitted peas, mustard or sand grains.

Hematite, on the other hand, forms a red powder when pulverized, and its fragments are not normally attracted by a magnetized knife-blade. Practically, the Lake Superior hematite is attracted to some extent, owing, probably, to the enclosed magnetite. Hematite crystallizes in flattish hexagonal forms, and when the crystals are imperfectly developed they tend to form plates or scales, like the well known micaceous hematite. This general difference between the platy or scaly structure of hematite and the granular structure of magnetite is useful in distinguishing the mineral logically important ore of iron known as martite. This ore is a magnetite that has been chemically altered to a hematite; it retains the form of the magnetite which it once was, but it has lost the chemical composition of magnetite and assumed that of hematite. In the same way its powder has no longer the black color of magnetite, but the red color of hematite. The martite can then be easily distinguished from hematite, as a rule, by its possessing the granular structure of magnetite, and from magnetite by its giving the red streak or powder of hematite.

The supposed hematite frequently occurs in thin layers in the jaspilite, and in irregular masses in the schists. Microscopic sections of these forms which the writer has examined always show that the supposed hematite does not occur in the form of hematite, but in the form of magnetite, hence was a martite instead of a hematite proper. It has been suggested by Brooks that all the Lake Superior ore was once magnetite, a view that has many facts to support it.

If one chooses to observe carefully the relation of the jaspilite to the schists in the mines, he will see that the former with its associated ore oftentimes irregularly branches or cuts through the schists (or soap rocks of the miners). This irregular branching character of the jaspilite is in full accord with the view that it is eruptive in its origin, which explains why it cuts across the foliation or platy structure of the schist. This leave them with the support, and with the sharp edges pointing downward. To this cause is due part of the great insecurity of the hanging walls of schist and the danger to the miners working beneath.

The question of the eruptive origin of the jaspilite and its associated iron ore is one of great economic and scientific interest, but our limits allow us only briefly to discuss it there. Their eruptive origin was in 1850 advocated by Foster and Whitney, but the view taken by these investigators was considered by subsequent observers to be incorrect, and the structure of the jaspilite explained by sedimentation, *i.e.,* that the iron ore was originally a bog iron or limonite which had subsequently been metamorphosed. In 1879 the present writer collected sufficient facts in the Marquette district then to prove, to him at least, that the sedimentary view was untenable, and that with our present knowledge the eruptive origin of jaspilite and its associated iron ore 84 with their subsequent chemical alteration by percolating waters, was the only view that would explain the phenomena as he then saw and figured them. This opinion was later endorsed by Selwyn, Director of the Geological Survey of Canada. More recently an attempt was made by Irving to explain the origin of the ore as a carbonate, but he, as well as nearly all the more recent advocates of sedimentation, starts out by either denying or belittling the occurrence of the very facts that

the present writer has figured, and that have caused him to hold the eruptive view. Any theory of the origin of the iron ores that starts out with a denial of the facts that it ought to explain, can hardly be accepted until it recognizes those facts and explains them. When this is done, and all the facts of the ore deposits collected, we may hope for some common ground of agreement, which will serve as a guide in exploring for and mining the ores. In accordance with this method of studying the ores and associated jaspilite, N. H. Winchell, in his discussion of the iron ore of the Vermilion district, in his report for 1886, admits the occurrence of the eruptive phenomena, but explains these phenomena as due to sedimentary and chemical action, instead of being due to eruptive causes. The late State Geologist of Michigan, Mr. Chas. E. Wright, had, as early as 1885, come to the conclusion that the only satisfactory explanation of part of the phenomena of the iron ores was that they were eruptive, and it must be admitted that no geologist in America was more familiar with the iron ore deposits of Michigan than he. It is a source of the deepest regret that he could not have lived to publish his evidence and conclusions.

The writer based his conclusions that the ores were eruptive, on the fact that the jaspilite and ore from dikes and intrusions in the associated sandstones and schists, inclosing fragments or “horses” of the schist; on their twisting, bending and indurating the schist, filling it with crystals of the ore; on their breaking in every direction across the foliation of the schist, as well as with it; on their pronged structure; on the former magnetite condition of the iron ore; and, as suggested by Whitney, on the great mass and purity of the ore, which is beyond that of any known sedimentary deposit. One fact that has an important bearing on this is, that the ore is never isolated in the schist, but is always connected with the jaspilite, and while that jaspilite may end in one direction like any dike, it has never been known to end in another direction, unless cut by a fault or by later eruptive rocks, so far as the writer can ascertain. So long, then, as the jaspilite can be followed, there is a prospect of obtaining good ore somewhere along its continuation. The irregular occurrence of the ore and its jaspilite, especially its being found in the most unexpected places thrust through the schist, is another strong evidence of its eruptive origin.

One of the economic aspects of the question is as follows: If the ore is sedimentary, it must follow the laws of sedimentation and be worked out the same as a coal bed, but if of eruptive origin its future is unlimited, except by the difficulties of deep mining, or because of its being cut out by the diabase and diorite or some other eruptive rock. If the view of Foster, Selwyn, Whitney, Wright and myself is correct, it means far more for the future permanence and success of the iron ore mining industry of Michigan than do any of the other views that have been suggested. This fact must not, however, influence our decision, which must be based purely on the evidence and its interpretation.

The intrusive relation of the jaspilite to the schist can be seen in the railroad cuttings southeast of the Marquette depot, where the writer discovered jaspilite dikes in 1888. Evidence of the eruptive origin of the ores and jaspilite can also be observed in most of the old workings about the Jackson, Cleveland, Lake Superior, and various other mines about Negaunee and Ishpeming, 85 although they are not as plainly marked now as when the workings were new, because of the weathering, the filling in of debris, etc. The entire region from Marquette to Michigamme is full of interest at every point, and nowhere can a student or geologist stop without finding problems worthy of his attention.

The jaspilite is well exposed in ridges to the southeast of the Jackson mine and elsewhere about it.

Two additional areas of iron bearing rocks were added by the State Geological Survey under Mr. C. E. Wright in 1885 to the parts already known, and shown on Irving's map published in 1883. The first added about forty square miles, mainly in the Yellow Dog River Valley, extending from the former known area to the centre of T. 50, R. 28. The second area added about thirty square miles in the Silver Lake district, the rocks being traced southeast into T. 48, R. 26.

The fragmental deposits of ore and jaspilite mentioned before are abundant in many portions of this district, in a large number of which they form the only portion of the rocks

worked for iron ores that the State Geological Survey has thus far observed. At Negaunee in the Jackson mine, pit No. 7, which lies only a short distance from the station, these fragmental formations make up the chief mass of the ore formation now exposed, passing upwards into a quartzite. The contact can be seen on the northeast side between the non-fragmental or original deposit and the secondary fragmental deposit made up of the debris of the former.

On the jaspilite a few rods south of this pit the detrital jaspilite can be seen resting on the upturned edges of the non-fragmental form.

In many places about the Jackson mine, and to the north of the mine, the fragmental overlying jaspilite formation can be seen, often passing in its upward continuation into a well-marked quartzite—a passage which is very common, especially when any great thickness of the fragmental deposit has been left. The schists about the Jackson mine also, in places, contain fragments of the ore and jaspilite. The fragmental jaspilite and ore is abundant about Ishpeming, especially at the Cleveland and Lake Superior mines. The old surface workings north of the Cleveland mine offices show these deposits, with their overlying quartzite, excellently well, especially the pit that contains the suspension or swinging bridge, and the one that has the inclined plane for footways. It will be seen that all these deposits are water and frost deposits made out of the debris of the iron formation, and that they gradually pass from deposits containing much iron ore and jaspilite, more or less angular, into deposits containing almost nothing except water-worn sand grains that form a quartzite.

At the Lake Superior mine the “Big W,” figured by Brooks (Geol. of Mich., 1873, I., 245) to prove the sedimentary origin of all the ore formations, is nothing except one of these overlying deposits of fragmental ore, jaspilite and quartz, made up chiefly of the detritus of the underlying true ore formation, whose origin was the point in question.

At Republic and Humboldt the formations at present observed appear to belong wholly to the fragmental ones, in which the detrital ore has been concentrated, either mechanically or chemically, in sufficient abundance and purity for the purposes of the miner, the Republic being one of the leading iron mines of Michigan. About Republic there may be seen, overlying the fragmental ore formation, a second fragmental formation made up of the debris of the former, together with much quartz. This latter formation in places passes into a true quartzite.

At Sec. 15, T. 48, R. 26, where explorations have been carried on for workable bodies of iron ore, the fragmental deposits of iron ore and jaspilite exist, and form, as at Republic, the ore deposits, so far as found.

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In the Cascade range all the formations of jaspilite and ore observed last summer are of the fragmental kind. Here the jaspilite, as well as the ore, occurs in distinct rounded fragments forming layers which are frequently interlaminated with quartzite. Overlying this detrital formation is another detrital deposit unconformable with it, and composed of water-worn debris derived in part from the underlying fragmental deposit of jaspilite and ore.

We have now to consider what the facts mentioned in the preceding pages require for their explanation, in the light of the principles also given, *i.e.,* that an eruptive deposit can yield its detritus as soon as the deposit has been formed; but a sedimentary one must exist for a long while, and be solidified and more or less changed, before its well-marked fragments can be deposited in an overlying formation of sedimentary origin. It needs also to be remembered that the fragments of jaspilite and ore in the overlying detrital deposits before mentioned are banded and possess the same characters as the non-fragmental underlying deposit does. Further, these fragments stand at every angle in the deposit, while the banding varies with the position of the fragments, showing that it belonged in the fragments before they were broken from their parent bed, and was not produced in them subsequently. From the above statements it follows that every one of these fragmental

deposits marks a distinct geological age in the Marquette district, unless the underlying formation be of eruptive origin. If the latter was the case, then it might mean merely sequence of time, but not necessarily difference in geological age.

In the Cascade range, if the hornblende schist mentioned previously is of true sedimentary origin, the overlying deposit is of a later geological age, but if the schist is metamorphosed eruptive rock, then no geological division can at present be established there. As stated before, the overlying granite and schist debris pass upward into a fragmental jaspilite formation that has been, and now is, mined about the Volunteer mine for iron ore. This fragmental formation is here supposed to be of the same geological age as the workable fragmental formations at Republic, Humboldt, etc., and the overlying fragmental formations seen at Negaunee and Ishpeming.

Overlying these fragmental formations comes a second deposition of fragmental material, which shows that here exists a true geological break or age, even in the series that is younger than the first detrital deposit derived from the non-fragmental jaspilite and ore. This last or overlying formation is best seen at the Cascade range, at Republic and at Holyoke. The above data render it probable that in the Marquette district there are three distinct geological formations or ages.

1st. The hornblende schist and granite of Cascade or Palmer and the non-fragmental jaspilite and ore of Ishpeming and Negaunee—the Cascade Formation.

2d. The fragmental jaspilite and ore, with their associated quartzites and schists, of Cascade, Republic, Humboldt, Ishpeming, Negaunee and elsewhere—the Republic Formation.

3d. The overlying conglomerates, quartzites and schists of Cascade, Republic, Holyoke and elsewhere—the Holyoke Formation.

Various working hypotheses may be suggested to account for the observed facts; if it could be proved that the supposed non-fragmental jaspilite and ore of Ishpeming and Negaunee are truly fragmental, their present relations being due to sedimentary and chemical action, and the squeezing together of the jaspilite and schist, then that formation could be put into the second or Republic Formation; while their overlying fragmental debris would then come into the third or the Holyoke Formation.

At present it is possible that further study may make out of these three formations at least from four to six different ones, or it may reduce them to 87 two. One or two season's more work will probably solve the vexed questions of the origin of the ores and the relations of the associated rocks.

DIABASE AND DIORITE.

Following the formation of the jaspilite and ore, and its denudation by the ocean waters to produce the detrital jaspilite and iron ore, together with the iron ore-bearing quartzites and conglomerates, immense masses of basalt were forced through the strata in a liquid condition. The introduction of so much new matter caused a squeezing and upturning of the earlier formed rocks, so that we now find the iron ore and jaspilite with their associated schists and quartzites lying against the sides of the eruptive basalts or forming the intervening low grounds. These basaltic rocks, being the later comers, have cut out the others, and frequently broken through the lower portions of ore and jaspilite, effectually barring further working of the ore in that direction. These old basalts have been very much altered, and now form rocks known as diabases, diorites and schists. It is not improbable that many of these diabase or diorite masses are the roots of old volcanoes. Many suppose that the altered basalts, that form the schists, pass into sedimentary schists, but such is not the case, as careful observation will determine where one ends and the other begins. The two look closely alike and are similar to each other in composition, but do not pass into each other any more than water and oil do, although an observer might not see the line of separation between the two. The contacts of the two formations can be seen

to the east of Ishpeming on a hill just north of the Cleveland mine, as well as elsewhere at points in which the altered and schistose diabase and diorite come in contact with the sedimentary schists. The contact of the hornblende schist with the diabase and diorite can be well seen in many places about the northern part of Marquette, where cuttings have been made, also where the break-water material was quarried, and upon Light House Point. Perhaps the most easily accessible places for the study of the old and altered basaltic rocks, with their associated schists, are in Marquette and vicinity, as well as along the railroad lines from Marquette to Ishpeming and beyond. The diabase and diorite form high rounded hills, often with precipitous sides, and they may be known by the greenish or greenish gray color of the rock. Good examples may be seen south of Ishpeming in the hill lying between the Lake Angeline and the Salisbury mines, also to the north of Negaunee, between that city and Teal Lake. Here the rough columnar structure of basaltic rocks, at right angles to their walls, can be well seen.

GRANITE.

In this district there occur two or more eruptions of granite, one of which is older than the detrital jaspilite, if not older than any of the ore-bearing formations, while another occurred subsequently to the eruptions of the before mentioned old basaltic rocks, or diabases and diorites. This granite has had a marked effect upon the geology and topography of the country, cutting out the schists and ores over large areas, and changing much of the schist into gneiss. When the granite possesses a banded or fluidal structure, it is called gneiss; but that term, the writer thinks, ought to be restricted to the metamorphosed, foliated, sedimentary rocks composed of quartz, feldspar and mica or hornblende, or both.

Gneiss and granite are abundant to the south of Ishpeming and in the vicinity of Republic, Humboldt, Champion and Michigamme. It can be found in North Marquette, at the mouth of Dead River, on the west side of Presque Isle, and upon the islands and shore to the north and northeast of that point.

Sugar Loaf is one of the prominent granite hills north of Marquette. The granite is composed mainly of quartz, feldspar and hornblende, with some 88 chlorite and mica. So far as observed, it is somewhat more coarse-grained than some of the ornamental granites; but it is suitable, if properly selected, for all heavy buildings, warehouses, dwelling-houses, piers, foundations, paving, monuments, etc.; that is, for nearly all of the uses to which granite has been put. The size and shape of the blocks also indicate that it could be advantageously quarried in large masses. The writer's attention was particularly called to this location by Mr. J. M. Longyear. A good porphyritic granite is found in the vicinity of Republic. The present writer has for years, long before he became a resident of the State, urged the development of the granite industry in this region, on the ground of the rapidly increasing use of granite, the immense amount of it in the district, and the all-important fact that direct water carriage exists to the large cities of Chicago, Detroit, Milwaukee, Cleveland and Buffalo, as well as to a hundred other Lake ports; while the only United States granite that can come into competition must be brought by rail from New England, Missouri, Minnesota, Wisconsin or some other interior locality. Most of the granite brought from the before mentioned places is of no better quality or appearance than Lake Superior granite, while it is not improbable that more careful investigation would reveal other grades than those before mentioned. Why should the authorities of the Calumet and Hecla mine be forced to bring granite for its use from the extreme eastern portions of Massachusetts, when granite equally good for their purpose is lying waste on the shores of our lake? The careful development of the granite industry would mean a great addition to the wealth of Michigan, and would be a great aid in advancing the towns in the vicinity of the quarries, as well as assisting in the improvement of lake and railroad traffic.

PERIDOTITE AND SERPENTINE.

At Presque Isle and the northwest of Ishpeming occurs another eruptive rock, which the present writer showed, in 1880, was originally a peridotite or olivine rock of the variety

known as Iherzolite—that is, composed of olivine, enstatite and diallage. This peridotite, since its eruption, has been altered to a greater or less extent, forming a rock known as serpentine, while in many places the formation of dolomite has also occurred as a result of the metamorphosis of the peridotite. Frequently the dolomite and serpentine are irregularly blended together, forming the variety known as verde antique.

No marble, in the proper acceptation of that term, occurs in the Marquette district, so far as is known, excepting the serpentine. Serpentine is a soft rock, and when of even texture is easily polished, making a beautiful stone for interior decorative purposes, but it is unfit for outdoor use, as it readily loses its polish on exposure, and is easily acted upon by the weather. Owing to the nature of serpentine its use is limited, but it is to be hoped that an early development of the serpentine industry in Northern Michigan may be found both practicable and profitable.

The locality at Presque Isle is one of the most interesting ones in which to study peridotite, as it occurs there well exposed, owing to its being washed by the waves of the lake. It is here seen as a dark to a black Iherzolite, passing into a serpentine of the same color, and also into one of a green color, especially on the northeast side. The peridotite is here worn into caves, and its surface traversed by a network of fissures filled with dolomite, chrysotile and silica, with occasionally some copper ores. Since accumulations of chromite or chromic iron ore, nickel ore, platinum, etc., are frequent accompaniments of the chemical alteration of peridotite, during the process of the formation of serpentine, explorers about the Ishpeming range ought to keep a careful watch for these substances.

A strongly marked fault or a fissure 89 along which the rock has moved, so that the different sides occupy a different position relative to each other than they formerly did, is to be seen in the serpentine at Presque Isle, a short distance north of the caves. Mr. Wright has suggested that there were two eruptions of peridotite as a solution of the difficult problems the rocks present on Presque Isle. This view had much evidence to support it, but further study by the winter goes to show that the so-called two eruptions

are phenomena caused by various fractures, fissures and joints, together with the unequal action of the percolating waters, as well as weathering. On the west side of Presque Isle one can find the granite with the serpentine adjacent. Excavations made by Mr. Seaman and the present writer prove to them that the contact of the two is an eruptive one, and that the peridotite is the later eruptive.

The Ishpeming serpentine is found to cut off and trend obliquely across the eruptive granites, diorites, diabases, etc., and not to be cut by the dikes which freely traverse the other rocks. All this indicates the later age of the serpentine. Direct proof of this is to be found on Sec. 31, T. 48, R. 27, in which locality the serpentine is seen in direct eruptive contact with diorite and chlorite schist, rendering the proof complete that the serpentine is the youngest of the large intrusive masses seen thus far in the Marquette district.

DOLOMITE.

Dolomite or magnesian limestone is found in various localities throughout the Azoic rocks. It is usually very impure, and contains a large amount of silica. One of the best known localities is south of Carp River, near the quartzites; another is at the Morgan furnace. As before stated, dolomite is of common occurrence in association with the serpentine north of Ishpeming, and here it belongs to the chemically formed rocks, being a product formed during the alteration of the peridotite to serpentine. Part of the Michigan dolomite belongs in one sense to the eruptive rocks as a product of their alteration, while part of it belongs to the sedimentary group.

DIKES.

During the time of the eruption of the diorite and granite, as well as subsequently, the country was traversed by fissures filled in by molten matter that formed dikes. In fact all the older rocks of the region are traversed by dikes, some of which run approximately east and west, and others north and south. The majority of these dikes are old basalts, that now form through alteration, diabases, diorites and schists. They are well developed on Light

House Point in Marquette, Picnic Point and Picnic Islands, and on the islands in the vicinity of Presque Isle. They show excellently well wherever the granite is exposed on the shore north of Presque Isle. At Presque Isle also the serpentine is cut by the later east and west dikes.

Others of these dikes are old rhyolites that through their alteration now possess the characters of a rock called felsite or quartz porphyry. They can be seen on Light House Point cut by the later basaltic dikes. They are also common in the Gold Range.

CHEMICALLY DEPOSITED MATERIALS.

Throughout the preceding pages illustrations have been given, that show the chemical action of the percolating waters found in all rocks, for there is no known rock, unless exception be made for rocks in the form of glass, that will not absorb water to a greater or less extent. All these waters are chemically active, whether hot or cold, pure or not; but it is undisputed that heat, pressure and substances in solution in the water greatly increase their chemical activity. It has been pointed out that all rocks are modified or changed through the action of the chemically active waters, leading either to the decomposition of the rocks or to a change in their mineralogical composition, and oftentimes to a change in 90 structure. It has further been pointed out that the alterations brought about by the chemical waters, with or without heat and pressure, has caused rocks formerly of the same character and composition to take upon themselves very diverse forms. It has also been noticed that rocks of entirely different origin and structure, like sedimentary and eruptive rocks, have been so changed by this action that the resulting forms are indistinguishable from one another except by their geological mode of occurrence.

All these changes in rocks have not proceeded without certain mineral matters being removed from one locality and deposited in another. A strong tendency is observed towards a localization of the moved mineral product, or towards special aggregation of mineral matter, some of which are economically of no importance, while others form useful

ore deposits. The special accumulations of this material in the Azoic system, that are of economic interest to us, are the veins and the soft ore deposits known principally amongst the miners as soft hematites.

SOFT IRON ORES.

Such igneous activity as that before mentioned could not take place in this region without the percolating waters becoming heated and their chemical and solvent action being greatly increased, for when the volcanic energies are dying, one of the last traces of that eruptive activity is shown in the hot springs.

The rocks amongst which so much eruptive matter has been forced are necessarily fractured, bent and twisted—the fractures serving as channels for the escape of the waters in the form of springs or as underground streams. It is found in the Marquette region that the jaspilite and the associated detrital rocks, that contain iron ore, have been greatly decomposed and affected by the percolating waters, generally hot; and that as a result the silica has been leached out and the oxide of iron deposited in its place, or else the original iron ore has been left behind or locally concentrated. Through the action of these percolating waters many of the siliceous schists, chlorite schists, argillites, quartzites and jaspilites, which were formerly worthless as ores, have been rendered valuable by having their siliceous materials largely replaced by oxides of iron, etc., giving rise to the ores locally known as soft hematites. Oftentimes the iron ores are locally aggregated in irregular chambers from which the original rock has been removed.

The-ores produced by the above described water-action are not only ores of iron like hematite, limonite and göthite, but also ores of manganese, like pyrolusite, manganite, psilomelane, rhodochrosite and wad. Barite, as well as other minerals, are found associated with the manganese ores in the vicinity of Negaunee. The soft hematites naturally occur in places where the rocks have been more or less arched, or bent and broken. They are very commonly found in the lower lands and on the sides of the diorite

and diabase hills, or in their vicinity, at points where the fracturing would naturally be greatest and the water would best act. The Salisbury mine was first worked at a point at which a large diabase dike breaks across the country and cuts obliquely through the large diorite hill that lies between the Salisbury and the Lake Angeline mines. The writer pointed out eleven years ago, that on the Lake Angeline side, at the point where this dike again cuts the jaspilite and schists, would be the most probable chance for finding another soft hematite mine, as at this point water action is going on even at the present day.

The soft ores are also found at considerable distance from the diorite hills when any action has caused the rocks to form suitable channels for water, so that they have become more or less decomposed.

VEINS.

One of the latest phases of the formation of deposits of value has been the 91 filling in of fissures by the water-deposited quartz and other vein materials, or, in case no crack nor fissure existed, by the removal of the country rocks along certain lines and their replacement by vein matter.

Veins formed thus may contain only quartz or other valueless minerals, gangue, or they may hold valuable metals and ores. It is in veins that the gold and silver north of Ishpeming are worked, the vein at the Ropes gold mine being in serpentine, while the others are in diorite, granite, felsite and schist. Quartz veins can easily be seen in the diorite hills about Ishpeming, and in many places in the Azoic rocks and elsewhere.

POTSDAM SANDSTONE.

The rocks of the Azoic system were still subject to the same denudation by frost and rain, and by the beating of the waves after that formation had been completed, that the different members of the formation had been subjected to before the entire system was complete. That is, there were deposited about the Azoic rocks mud, sand and shingle,

in like manner as such materials are being deposited on our lake shores at the present time. This detritus, on consolidation, has formed a series of shales, sandstones and conglomerates, which overlie or abut against the Azoic rocks, and are formed out of the debris of the latter. These sandstones form in Michigan the base of a new system of rocks known as Palæozoic, or ancient life, from its containing the earliest authentic remains of animal life. The sandstones are generally considered to be the equivalent of a sandstone in New York called the Postdam sandstone—hence the rocks are said to be Potsdam.

South of Carp River this sandstone can be seen lying against the Azoic quartzites and formed out of their debris. The Marquette sandstone quarries are in the Postdam sandstone, and at the base of the quarries may be found conglomerates made up of the underlying Azoic quartzites, diorites, argillites, schists, etc. A short distance south of Hotel Marquette can be seen on the west side of Champion Street, leading to South Marquette, some rounded diorite and schist knobs that have been polished and grooved by former glacial action.

These knobs have been exposed by excavations made for the purpose of obtaining filling for some adjacent ravines. A matter of special interest is the finding of small veins of the formerly overlying Postdam sandstone that has filled the cracks in these rocks, that formed bosses or little knobs on the shores of the old Postdam sea. The Postdam sandstone is found overlying much of the serpentine of Presque Isle where the basement conglomerate is well exposed, although that conglomerate has subsequently been much altered, apparently, by heat and water. The same sandstone occurs further north on the shore, and on some of the islands that overlie the Azoic granite, which has been decomposed for some distance below the base of the sandstone. This decomposition is seen to extend to the boulders of granite and other rocks in the basement sandstone and conglomerate. These changes unquestionably have occurred since the sandstone has been deposited, and the precolating waters are apparently the cause of the decomposition. The sandstone extends, with greater or less continuity, along the shores of Lake Superior, around Keweenaw Bay and Keweenaw Point. On Partridge Island clayey or sandstone fragments

occur abundantly in the Postdam sandstone itself. They are not probably fragments of another formation, but water-worn masses of clay, etc., derived from the Postdam sandstone itself. The writer has seen similar deposits being formed on the Bay of Fundy in the vicinity of St. John. Postdam sandstone is quarried to a considerable extent at various points in Northern Michigan, chiefly at Marquette and Portage Entry. It makes a very pretty building stone, and one for which there is ready sale. Some of the 92 prominent buildings constructed of the Marquette stone are the High School building and several business blocks in Marquette. Of the Portage Entry stone examples can be seen in several of the business blocks at Marquette, the State Prison at the same place, and the National Bank and the Mining School at Houghton.

The potsdam sandstone was evidently

OPEN PIT IRON MINE A DRINK VIEW IN AN IRON MINE

formed on the shores of a body of water accessible to ocean tides, as it shows ripple-marks, sun-cracks, rain-drop impressions and mud-flows, which indicate conditions that are only known to exist in localities where the alternate ebb and flow of the tides occur.

During the time of the deposition of this sandstone, volcanic activity commenced again, and the central portion of Keweenaw Point is found to be composed of alternating lava-flows, sandstones and conglomerates, deposited upon the tide-washed sinking shores of the sea. The intermittent volcanic activity ceased for a while after the main range of Keweenaw Point was formed, leaving time for the formation of a broad belt of sandstone and conglomerate; but again recommenced, forming the basaltic rocks exposed along the northern side of Keweenaw Point at Eagle Harbor, Agate Harbor, Copper Harbor and elsewhere.

In connection with these lava-flows from fissure eruptions which were of a basaltic character, there was also extravasated much volcanic material of a trachytic and rhyolitic

nature, the debris of which makes up the chief portion of the interbedded sandstones and conglomerates. These occur in the form of intrusive dikes, bosses, etc.

The basaltic rocks forming the southeastern range of Keweenaw Point, known as the Bohemian Mountains, were considered by Foster and Whitney to be intrusive masses erupted subsequently to the formation of the main deposits in this region. Irving, however, considered them to be ordinary flows, like the rest of the lava-flows of Keweenaw Point. He does not advance any special proof of this proposition, while the phenomena presented by him, as well as by Foster and Whitney, appear to be more in accordance with the view that they are later eruptive masses, as held by the last-named observers. However, the question is yet an open one. The basaltic lava_flows are known to be such, as pointed out by Foster and Whitney, by their baking, or indurating, or hardening the underlying rock; by their sending dikes and tongues down into the rocks; by their having caught up fragments of the underlying rock; by their crystalline structure being best developed below the centre of the flow; by their having no effect upon the overlying conglomerate, 93 while the debris of the lava is to be found in the base of the conglomerate; by the overlying conglomerate and sandstone filling cracks in the underlying lava-flow, etc. The thinner basaltic lava-flows were cooled quickly, so that they contained much glass, which was readily decomposed by the percolating waters. In their altered condition they now form rocks known to geologists as melaphyrs, but which are locally called amygdaloids.

The thicker flows formed heavy beds, which cooled more slowly, became more crystalline and were less easily affected by the percolating waters than the thinner flows. These heavy flows, owing to their alteration, now form rocks by geologists named diabases and gabbros, but locally called traps and greenstones. All these now different rocks were once lavas of the same chemical constitution, differing only in structure and in those differences of crystallization and mineral constitution that result from slow or rapid cooling.

These flows must have taken place over the gently sloping tide-washed shore of a sea, whose shore was gradually, or, it may be, at times abruptly sinking, so that the flows and their detrital deposits accumulated at about the same rate as the shore sank, making the shore line approximately constant. This must have been the case, or the lava-flows and conglomerates would have been more irregular, less constant, would have covered a more limited area, and would soon have been built up beyond the reach of the waves.

Owing to the natural irregularities of a lava-flow, and of the resulting inequality of the sedimentary deposits, it is to be expected that some inequalities in thickness of both formations should exist, and that sometimes one or the other should be wanting. For instance, if a portion of the lava was raised above the sea, that portion would not be covered by either sandstone or conglomerate, but only by its own decomposition products, if even they were not carried away by the rain. Hence it would happen that the material between two flows would be marked at one point by a conglomerate, but elsewhere only by a thin seam, or else the two flows would be interfused.

It also frequently happened that a comparatively short time existed between two flows. In such a case little or no conglomerate could form between them, and as the latter flow fused again the top of the earlier flow, the two became united into one mass, so that it is difficult to ascertain where one begins and the other ends.

THE COPPER-BEARING OR KEWEENAWAN SERIES.

The relation of the lava-flows with their interbedded conglomerates to the Potsdam sandstone on the east is a matter of great scientific and economic interest, and has given rise to much discussion, which is liable to continue for many years to come, until the whole truth shall be known. In the report of Foster and Whitney, the eastern sandstone was considered to be once continuous with the sandstone that lies to the west of Keweenaw Point, but it was thought that the two parts had been separated by a fracture or fault plane that extended along the entire southern side of Keweenaw Point. This fault allowed the

sandstone on the east to remain horizontal, while the lava-flows on the west were tilted up at the same angle that they at present have, and the overlying western sandstone was subsequently worn away. The sandstone east of the fault line was said to lie horizontally, or to dip to the southeast.

Later, attention was called to certain observations made along the line of the fault, especially at the Douglas Houghton Falls. These observations caused the lava-flows and their interbedded sedimentary rocks to be considered as an older geological formation than the eastern or Potsdam sandstone. The lavas were said to form an old sea-shore bluff on the Potsdam sea, and the sandstone was laid down horizontally, abutted against the cliffs, 94 and was formed from their water-worn debris. Various other opinions have also been advanced, reference to which our limited space does not permit.

In 1879 the present writer made an examination of the formations at the points at which, on the Douglas Houghton and Hungarian Rivers, the eastern sandstone comes in contact with the lavas, or, as they are now commonly called, the copper-bearing rocks or Keweena wan series. He found that the sandstone, instead of lying horizontally, dipped gradually or irregularly toward the northwest; and that, instead of abutting against the copper-bearing rocks, they were overlaid by the latter, and the two were interbedded. Later, the correctness of these observations was denied by Irving, who upheld the view of the greater age of the copper-bearing rocks, but moved the supposed sea-shore cliff from its former supposed locality and placed it elsewhere. Subsequently the question was taken up by Irving and Chamberlin in defence of the view that the copper-bearing rocks are older than the eastern sandstone. If, however, one will take their published observations, together with the sections of this later work, he will see that their preceding observations are discredited, and that they fully sustain the correctness of the present writer's statement, that the sandstone dipped under the copper-bearing rocks instead of being separated from them by a vertical fault or an old sea bluff. The result is, that in the main point at issue the present writer was shown to be carried, *i,e.,* that the sandstone, did underlie the copper-bearing rocks, and the main question was then transferred to one

of interpretation. Do the lavas overlie the eastern sandstone on account of their having flowed over them in the form of a molten lava, as the writer claims, or have the lavas been thrust up over the sandstone through the motion of an older solid mass along an oblique fault plane, as last held by Irving and Chamberlin?

During the summer of 1889 an examination of that question was made by the State Geological Survey, and the rocks uncovered along the line of contact of the sandstone and lavas for the purpose of ascertaining their exact relations. The result has been to prove to the present writer, beyond any reasonable doubt, that on the Douglas Houghton and Hungarian Rivers, as well as on Sec. 20, T. 56, R. 32 N., the sandstone does dip gently toward the lavas, and finally passes under them with an increasing dip; that the junction is not a fault junction but that of a lava-flow upon an underlying soft sand and mud. The lowest bed of melaphyr was found on the Douglas Houghton River to be overlaid by sandstone, as described by the writer in 1880, although this fact had been denied by the before-mentioned authors. The copper-bearing rocks on the north side of Douglas Houghton River are seen to overlie the eastern sandstone for about 150 feet. Along the line of contact to the north on the St. Louis location and in Wall ravine, as well as south of Portage Lake, proof of distinct faulting could be obtained, which sustains the fault claimed by Foster and Whitney, Irving and others. Along the Douglas Houghton contact no sign of any fault existed, but in the copper-bearing series just below the falls, several fractures with evidences of the motions of sides were observed that would indicate a faulting here.

The fault plane, wherever observed along the line of contact, showed that the overhanging wall was on the side next the copper-bearing rocks. It is well known by all miners and geologists that in all normal faults, *i.e.,* the commonly occurring faults, the rock on the hanging side of the fault has slipped down relatively to the rock forming the foot wall. A reversed fault is one in which the hanging wall side has been pushed up on the foot wall side of the fault. The reversed faults are generally considered to be 95 rare, so much so that some geologists deny that they ever occur, although the present writer has seen them associated with normal faults in the Cheever ore bed at Port Henry, New York. This rare

mode of faulting is the one assumed by Irving, who was obliged also to assume that the uplift of the hanging wall was accompanied by a thrust to the eastward, a view that some observations by the Geological Survey, especially by Mr. Seaman, would sustain, but which the present writer thinks need more careful examination and further confirmation before they are accepted as conclusion, since all can be explained by the repeated movements that usually occur along the sides of a fault.

The present writer holds that the sandstone, which all have agreed was eastern sandstone, underlies the copper-bearing rocks, and that the first lava of that series flowed over the eastern sandstone, which is older than the copper-bearing or Keweenawan series. Subsequently a fault line or fissure was formed, running near what is now the point of contact of the sandstone and lavas, sometimes exactly at that point, sometimes on the lava side, and probably sometimes on the sandstone side of it. Along this fissure it is probable that a normal fault occurred, along which, by the slipping down of the hanging or wedge-shaped side, the sandstones and their interbedded lavas were more or less bent downwards or contorted, as they are now found to be. This normal faulting accounts for the fact that sometimes the lava and sometimes its associated conglomerate is brought in contact with the eastern sandstone along the fault line. It is to be remembered that in almost all faults there is more or less rubbing back and forth, or up and down motion, although the final result of these varied motions is the production of a reversed or normal fault according to the direction in which the greatest amount of motion took place.

This view would explain most of the difficulties that geologists have had in understanding this series, especially if it should be shown that the lava-flows came from the main lake side instead of from the Keweenaw Bay side, as that would only require the cut-off remnants of the edges of the lava-flows to be removed by denudation on the Keweenaw Bay side.

Should the reversed fault be proved to be the true one then the view of Foster and Whitney concerning the relations of the copper-bearing rocks would appear to be more

correct than that of Irving, while a normal fault would be consistent with the theory that the copper-bearing rocks are of Triassic age.

VEINS AND COPPER DEPOSITS.

Besides the fault before mentioned, numerous fissures cross Keweenaw Point instead of running longitudinally with it, and more or less faulting occurs along these fissure lines. Portage Lake lies in a trough excavated along one of these fissures, while many of the others are filled with vein matter which has been mined to a greater or less extent. These fractures and fissures with faulting across Keweenaw Point probably were developed subsequently to the formation of the longitudinal fault or faults, if more than one such fault shall later be proved to exist. Should such be the case, it would account for part of the assumed thickness of the beds.

The before mentioned fissures seem to have been formed by powerful movements of different parts of the rocks that caused the cross fracture and dislocation of the latter. The movements were repeated from time to time, causing a rubbing, grinding, breaking and polishing of the parts adjacent to the fissures. After the main fissures had been formed, the subsequent movements would not cause any very extensive secondary breaking of the compact and heavy beds of diabase and conglomerate, but in the soft and scoriaceous melaphyrs the fracturing would be much greater, so that the parts adjacent to the fissures would be 96 much broken. During the time of the fracturing, and subsequently, these fissures served as channels for the chemically active waters, which also percolated through the adjacent rocks. In the scoriaceous and easily decomposable melaphyrs the veins were widened by the decomposition of the adjacent rock, but in the coarsely crystalline and heavy diabases, as a rule, the same effects were produced, either not at all or only to a limited extent. The sandstones and conglomerates, being composed principally of trachytic and rhyolitic material, are much less affected by percolating waters than the basaltic rocks, hence the fissures are not generally widened in them, especially if they are in thick beds. At the time when the percolating waters were acting on the

rocks adjacent to the fissures they were also working in the rocks everywhere upon the Keweenaw Point.

In many localities the evidence is strong that the percolating waters were hot, while in others, as remarked by Marvine, no sign exists that they were above the temperature of the waters of the present day. These waters percolated with more or less readiness through the rocks, causing a greater or less alteration and decay; while the substances they took up were deposited in any fissures, cells or other open spaces that existed in the rock, or else portions of the rock were dissolved out and their places refilled. This is strikingly seen in the conglomerates, like the Calumet and Hecla, in which pebbles of the easily decomposable melaphyr have been partly or entirely removed and their places filled with copper or some other minerals.

Besides copper, the deposited minerals are mainly quartz, calcite, epidote, laumontite, prehnite, delessite, chlorite, datolite, analcite, orthoclase, apophyllite, etc. All, or nearly all, of the materials that fill the crevices, cells and other places in the lavas and conglomerates apparently were derived from the decomposition of the lavas themselves, and the course of the waters carrying these materials in solution seems to have been downward. The fissures that form the veins were filled at the same time and by the same agencies as those that acted upon the rocks, and the materials in them likewise appear to have been obtained from the adjacent rocks themselves. In the narrower portions the veins are often filled with vein matter proper, but in the wider portions the veins are often composed of broken-up masses of melaphyr, etc., cemented by vein matter.

In the veins the copper is found intimately mixed with the gangue, or in sheets or irregular masses. In sheet form the copper extends downward or has its sides approximately parallel with the vein. Oftentimes the sheet divided, and held between its parts some of the gangue or melaphyr. It is also not uncommon to find, entirely enclosed in the copper, masses of melaphyr, quartz, calcite or other vein materials. The melaphyrs themselves are

often impregnated with copper adjacent to the veins. Good illustrations of the veins can be seen at the Phœnix, Cliff, Central, Copper Falls, and other mines in Keweenaw County.

In the vicinity of Hancock, Houghton and Opechee, some of the old lavas are mined. As stated before, these old lava-flows, which now form melaphyrs (amygdaloids), have been greatly acted upon by water, and have had deposited in their mass different minerals associated with more or less copper. The copper is generally deposited in an irregular manner in the melaphyr, forming strings, globules, irregular masses, etc. These deposits are not in the form of veins, but are impregnations of old lava-flows, and hence are in the form of beds. As an example of mines worked upon these old lava-flows there may be cited the Quincy, Franklin, Osceola, Atlantic, Huron, and the Copper Falls in part. The Copper Falls has been worked in part on an old lava-flow of a very scoriaceous character, that formed originally a black, rough, cellular lava sheet covered with clinkers, similar to many well-known modern lava-flows. At the time of the 97 flow, or after it, the interstices were filled with detrital mud, while the various parts of the flow appears to be connected, and do not form true water-worn pebbles. The writer has collected at Copper Falls portions of the rock that show the hardened exterior crust and the cellular interior, as they occur in small masses and bombs of modern lavas, while he has found preserved intact the original ropy, stringy, twisted surface of the lava. The Copper Falls bed, above described, is locally called the ash-bed, but it is a melaphyr or true lava-flow, and not a bed of volcanic ashes. The Atlantic mine appears to be worked upon the same or a similar formation.

Besides the veins and lava-flows, the conglomerates have also been found in places to have had their interstices filled in with copper and other minerals. In them the old cementing mud, and oftentimes the pebbles of melaphyr, have been removed by percolating waters, and their places filled with copper, which penetrates even the minute cracks in the hard rhyolite (quartz porphyry) pebbles. These old sea-beach conglomerates are now worked in the Calumet and Hecla, the Tamarack, the Allouez and other mines. There are thus mined in this region three district classes of deposits:

Copper Deposits of Keweenaw Point.

1° Fissure viens.

2° Lava-flows (melaphyrs or amygdaloids.)

3° Conglomerates.

Conglomerates are known to be old sea-beach deposits, like those that are forming along the lake or ocean at the present time. This is proved by the rounded and water-worn character of their pebbles and grains; by the observed water action on the surface of the underlying lava-flow; by the fact that at their base the conglomerates contain considerable basaltic mud and pebbles derived from the underlying lava, both of which diminish in amount or are entirely wanting as the distance from the underlying trap increases.

That the copper was deposited from water, with or without electro-chemical action, is shown by the fact of its being found inclosed entirely in minerals known to be formed by water only; also by its inclosing such minerals; by its being found in disconnected or isolated masses in the lavas and elsewhere; and by its greater abundance where there are to be seen the most signs of water action. Had the copper been deposited by igneous agencies, it would have had a channel or line of passage, and been continuous along that line of passage, while all the different masses of copper would have been connected together downward, unless separated by fractures or faults.

The copper seems to have needed for its deposition the open spaces of veins and fissures, and rocks that were porous and cellular, those whose parts were easily removed by the percolating waters, like melaphyrs or the cementing mud of the conglomerates. In truth, the copper seems to have been deposited wherever there were found any places in which to leave it. From the fact that the copper is generally found most abundantly under the heavy lava-flows, and associated with minerals evidently the production of the

decomposed lavas. it appears probable that the copper was once finely disseminated through the lavas and has since been concentrated by waters percolating through them. Had the copper been derived from the sandstones, then one would suppose that under them should be found the greater supply of copper, but such is not the case. That the course of the copper was generally downward is indicated by the finding of spikes of copper and calcite that extend from one bed down into others, with the small end downward like an icicle; by the fact that when the copper is not uniformly distributed throughout the bed or flow that is mined, it is apt to be more abundant in the upper portion of it; and by the fact that the largest masses of copper 98 have usually been found in the upper portions of the veins.

That the copper was deposited after the copper-bearing series was complete is shown by the fact that it is found in fissures extending across the beds, that could only have been produced after the beds were in place; by the fact that the copper was deposited subsequently to the jointing of the lavas, owing to its now being found wrapped around the pieces formed by jointing, just as paper is wrapped around a piece of soap; and by the extension of the copper from one bed down into another as a continuous mass.

The means by which the copper was concentrated and deposited as native copper instead of occurring in the form of the usual copper ores, is an interesting, and as yet unsolved problem, that awaits the chemist who is willing to give his time and attention to the subject.

The structure of Keweenaw Point may be then summarized as follows: A deposit of sandstone overlaid with lava-flows mingled with more or less interbedded conglomerates, and finally overlaid by sandstone. Subsequently these beds suffered longitudinal and cross-fracturing and faulting. Later all were acted upon by percolating waters, both hot and cold, by which the rocks were altered to a greater or less extent, and by which the copper was concentrated and stored up in the conglomerates, lavas and veins in which it is now found.

The above account gives in brief a general idea of the geology of the regions touched upon here, as the writer interprets the facts observed. He is, however, aware that different interpretations of the same facts may be made by others. He has, therefore, called special attention to the important differences of interpretation, and he will endeavor to continue the investigation, and seek only the facts and the truths to which they point. As in the question of the iron ores, their origin has a direct bearing on their amount and the permanence of the deposit; so, too, in the copper-bearing rocks, the question of their relation to the eastern sandstone is one of great economic interest in these days of diamond drills and deep shafts. One can readily see this when he considers that it involves the question: Do the copper-bearing rocks extend out under the eastern sandstones or not? If they do, their exploration becomes merely a question of how great a thickness of sandstone must be bored through. If they do not, then the question ought to be settled by the geologist, if possible, in order to save waste of money in unnecessary exploration on the part of those that are interested in mining.

MINERAL LOCALITIES.

Presque Isle. —Serpentine, galenite, pyrite, chalcopyrite, dolomite, chalcedony, agate, chrysotile, enstatite, diallage and olivine.

Partridge Island. —Agate in narrow veins in the gabbro.

Picnic Islands. —Epidote, hornblende.

Holyoke District. —Galenite.

Mt. Mesnard. —Chalcocite, hematite.

Negaunee. —Hematite, limonite, göthite, pyrolusite, manganite, psilomelane, wad, barite, kaolinite, rhodochrosite, jasper, calcite, quartz.

Ishpeming. —Hematite, limonite, chlorite, jasper, pyrite, quartz.

Gold Range. —Gold, pyrite, pyrrhotite, tourmaline, epidote, molybdenite, magnetite, pyroxene, dolomite, picrolite, verde antique, serpentine, precious serpentine, chrysotile, talc, williamsite.

Humboldt. —Ottrelite, tourmaline, magnetite, hematite, grunerite.

Republic. —Magnetite, hematite, staurolite, hornblende, garnet.

Champion. —Garnet in chlorite schist, tourmaline, chloritoid (masonite), hematite, martite, magnetite.

Michigamme. —Garnet in chlorite schist, magnetite.

Wetmore, Webster and Beaufort

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Mines. —Limonite in earthy stalactitic and mammillary forms.

L'Anse. —Graphite, wad, limonite, pyrite.

Houghton. —Copper, silver, whitneyite, domeykite, algodonite, delessite, chlorite, quartz, epidote, calcite, prehnite, laumontite.

Keweenaw Point.—Quartz, calcite, epidote, prehnite, analcite, laumontite, datolite, heulaudite, amethyst, cuprite, apophyllite, chrysocolla, chalcosite, chalcopyrite, chabazite, barite, jasper, azurite, malachite, delessite, chlorite, wollastonite, etc.

Michigan Mining School, Houghton, Michigan. *January* 23, 1891.

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